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Bell Telephone MAGAZINE

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A Medium of Suggestion & a Record of Progress

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LEROY A. WILSON, *President;* CARROLL O. BICKELHAUPT, *Sec.;* DONALD R. BELCHER, *Treas.*

Who's Who & What's What

in This Issue

FEW PEOPLE realize how many companies are engaged in furnishing telephone service to this country. Even fewer appreciate the complexities involved in coördinating the facilities and services of all these companies in a nation-wide service which enables "anyone, anywhere, to pick up a telephone and talk to anyone else, anywhere else, quickly, clearly, and at reasonable cost." A. ROGER CHAPPELKA is well posted on the situation, however, because for the past six years he has headed an A. T. and T. group handling inter-company compensation matters. This activity has included not only revisions of settlement arrangements with connecting companies but the development of arrangements with them for coördinating new services, such as mobile telephone service and community dial operation. Joining the Ohio Bell Telephone Company in 1921, he was a division commercial engineer with that company when, in 1926, he transferred to the American Telephone and Telegraph Company in New York, in the commercial results and practices section of the Department of Operation and Engineering.

A STATEMENT of the Bell System career of Vice President KEITH S. MCHUGH was published in the issue of this MAGAZINE for Summer 1948, to which he contributed a discussion and analysis of "The License Contract."

SEVERAL BELL SYSTEM OFFICIALS have had unusual opportunities to serve their country in connection with the establishment of the Office of Civil Defense Planning and the development of its program. Its first director was Russell J. Hopley, president of the Northwestern Bell Telephone Company, who took a leave of absence of nearly a year, at the request of Defense Secretary Forrestal, to organize the enterprise from the ground up. Upon his return to the Northwestern Bell company last November, Mr. Hopley was

A. Roger Chappelka

Keith S. McHugh

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Harry H. Hoopes

Alvin von Auw

awarded the first Certificate of Appreciation ever to be granted by the unified National Military Establishment, for his "exceptionally meritorious service."

The organization of the Office of Civil Defense Planning has been kept small, but its director was able to enlist the services of executives in various branches of industry. From the System, the chief of the technical division was Horace H. Nance, Engineer of the Long Lines Department; and Allan G. Barry, operating vice president of the Wisconsin Telephone Company, served briefly as chief of the organization planning division. Communications advisor was Herbert J. Schroll, assistant vice president of the New York Telephone Company, whose length of service equaled Mr. Hopley's, and who now, after his return to New York, is still retained as a consultant. Members of the advisory panel for communications services are Theodore Berrier, A. T. and T. assistant vice president, and John B. Rees, now operating vice president of the New Jersey Bell Telephone Company. Mr. Hopley has been succeeded by Aubrey H. Mellinger, former president of the Illinois Bell Telephone Company and now retired from that post.

The communications aspects of the Civil Defense program are reported in this issue by JUDSON S. BRADLEY, who, after several years of editorial and publishing experience, joined the General Information Department of the Southern New England Telephone Company in 1925. Five years later he became a member of the corresponding department of the A. T. and T. Company, and he has been since 1943 the editor of this MAGAZINE.

THIRTY-SEVEN YEARS in Traffic work have given ERNST J. GUENGERICH a pretty

(*Continued on page 272*)

Justin E. Hoy

Long distance cables stride across the countryside on private right-of-way.
See "Right-of-Way Comes First," beginning on page 240

Coöperation and Coördination throughout the Industry in Working Out Common Problems Provide a Unified Telephone Service for the Nation

Six Thousand Telephone Companies Serve U. S.

A. Roger Chappelka

ABOUT 6,000 separate telephone companies join in furnishing our nation's telephone service. Only twenty-three of these are Bell companies. The remainder are non-Bell, or "Independent"; in other words, they are independently owned and operated and not a part of the Bell System.

A few round numbers will indicate the size and importance of the Independent group in the industry. Eleven thousand Independent exchanges, scattered from coast to coast, serve some 6,000,000 telephones. The toll circuits connecting Bell and Independent exchanges handle nearly 500,000,000 messages a year. The annual revenue from these messages is $250,000,000.

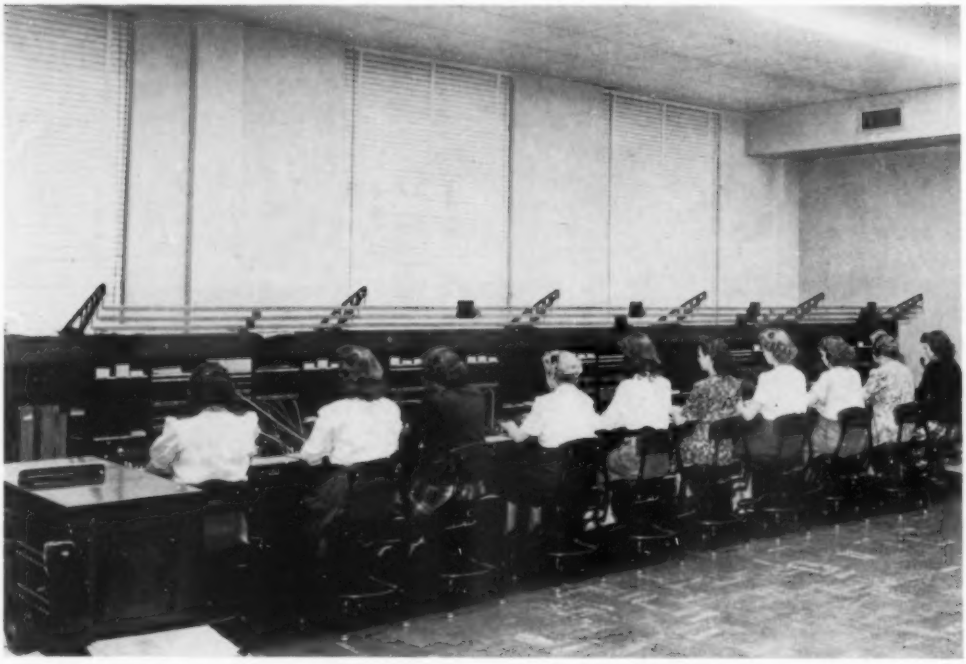
The Independent companies vary considerably in size. The smallest ones may serve fewer than a dozen telephones, often connected to some simple switching device on the wall of a country store or an owner's residence. The largest Independent system serves more than 1,000 localities in 19 states. Some of the larger cities served by Independent companies are Erie, Pa., Fort Wayne, Ind., Lincoln, Neb., Long Beach, Cal., Rochester, N. Y., Santa Monica, Cal., and Tampa, Fla.

The problem of coördinating the operations of so many separate companies—Bell and Independent—is complex, and requires properly timed action on many widely diversified inter-company problems.

Bell-and-Independent Coördination

INDEPENDENT and Bell people have been for many years working together, thinking together, and planning together. Both recognize the importance of maintaining two strong groups in the telephone industry. The effectiveness of the coördination between these two groups can be demonstrated in many ways.

When you listen to your favorite radio program, for example, you



Toll offices of Independent telephone companies have been expanded and are working at full capacity to keep pace with the increasing volume of calls

probably are not aware that Independent companies may be providing some of the network facilities. When you talk with a distant toll operator, you cannot tell whether she is a Bell or an Independent employee. Even when you drive along the highways, it is difficult to tell whether the telephone line at the side of the road is Bell or Independent. Except to telephone people, it isn't of any particular importance.

After half a century, what problems can still exist that require coördination?

The answer to this question is twofold.

First is the day-to-day job of keeping the facilities and operations of 6,000 telephone companies effectively coördinated so that nation-wide service is practical.

Second is the joint planning and introduction of new services, techniques, and methods which make improved and added services available to all telephone users, whether Bell or Independent.

The Day-to-Day Job

OF THESE TWO DIVISIONS of the work, the day-to-day job may seem to be the less spectacular. So let's look at a few selected items to illustrate its character and importance.

A good lead-off item is message toll telephone service.

There has been a tremendous growth in this business. The volume of business over individual toll routes fluctuates for such reasons as changes in customer requirements, seasonal

variations, and usage peaks caused by special events. There is, therefore, a continuing job of following the volume of toll business and taking steps to insure that adequate but not excessive toll facilities are maintained. When a change in toll facilities is to be made, it may involve either Bell or Independent companies, or both. Hence the need for coördinated planning by the several companies furnishing the required facilities.

Another good illustration is the continuing work associated with the private line services.

Numerous extensive networks are presently serving such customers as the press, broadcasting companies, pipe line companies, and government agencies. Most of these networks involve both Independent and Bell facilities. Frequent changes in locations of stations are necessitated by changes in customers' requirements. The broadcasting companies and the press in particular originate a substantial volume of requests for short-term additions to their networks. These added stations are used in covering news, sports, and other events of special interest. The event may take place in either a Bell or an Independent exchange. In many of these cases there is no chance for advance planning. The news event breaks and the service is wanted immediately. Here again, prompt, effective action on the part of the companies involved is imperative.

There are occasions also when one company may ask another for information or advice on day-to-day maintenance problems, improvement of traffic operating performance, or some

Independent companies recognize that good business-office service includes arrangements for the comfort and convenience of their customers

similar matter, in order to promote further coördination of over-all service. On such occasions, for example, a Bell plant man, if asked to do so, would be glad to suggest how a specific central-office equipment problem could be overcome; or a traffic representative might have information on Bell System operating experience which would be helpful to an Independent company in improving the performance of its operating force. The larger Independent companies render similar assistance, of course, to the smaller Independent companies.

The negotiating of inter-company agreements covering the division of responsibilities and revenues on services involving the use of both Bell and Independent facilities, and the handling of inter-company settlements, is another important phase of the day-to-day job.

Coördination of New Services and Projects

THE INTRODUCTION of new services, new equipment, and better and more economical ways of doing the job requires close coördination between Bell and Independent companies. To demonstrate the importance of Bell-Independent teamwork here, let's consider the following projects.

NATIONWIDE OPERATOR TOLL DIALING

This project provides that the toll operator at the originating end of a toll call will dial straight through to the called telephone without assistance of intermediate operators, whether the call is to a neighboring town or across the country.* The result is a faster and more efficient toll service.

This is a fundamental change. It requires the highest degree of Bell-Independent coördination, including both the operating and manufacturing branches. It involves such far-reaching matters as establishment of a universal numbering plan for all exchanges, use of matching dial equipment at terminal and intermediate exchanges, and a layout of toll circuits designed to provide the most efficient arrangement of direct and alternative routes.

The entire telephone industry is actively engaged in extending rural telephone lines, to bring service to an increasingly greater number of farms

* See page 228.

Community Dial Central Office (CDO) Conversions

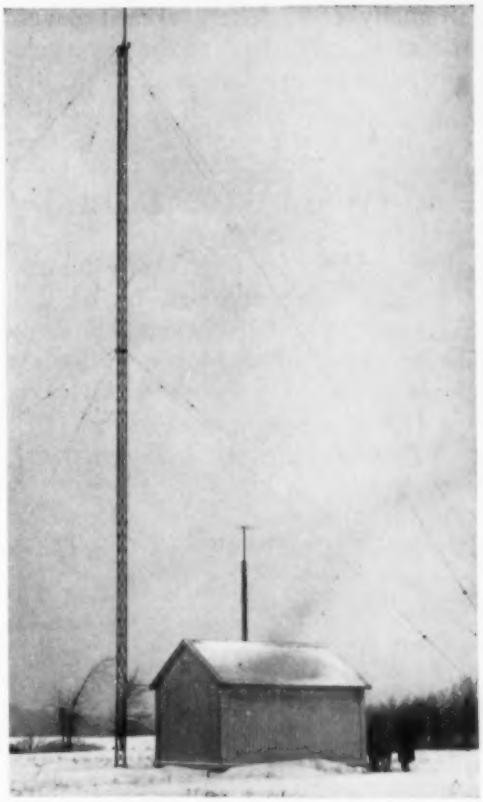
A CDO is a type of dial central office where the equipment is housed at one location while the operators required to handle toll, information, and assistance calls are located in another office or even in another exchange. Plans for the next few years include conversions from manual to CDO operation in a large number of smaller exchanges.

Past experience and present planning emphasize the need for coördination and coöperation on the part of all companies, both Bell and Independent, involved in a new CDO project. For example, the engineering of a CDO requires consideration of inter-company plans for toll plant layout and operation as well as local requirements. Actually, it may develop that the most effective arrangement is to handle the operator office work (information, assistance, etc.) for a new CDO in the nearby central office of a company other than the one owning the CDO.

An Independent company, considering for the first time the desirability of introducing community dial operation in one of its exchanges, can often benefit from the experience of other companies which have dealt previously with such problems; and where two companies may be involved in a CDO project, there are important cost and service advantages to both companies in effective joint action.

Mobile Telephone Service

Another example of coöperative Bell-Independent thinking and planning is the recent introduction of mobile telephone service. It was clear from the start that most careful attention would have to be given to the problems of all companies to utilize fully the limited number of available radio telephone frequencies and to secure participation by all companies within reach of a mobile station.



Several Independent companies are furnishing mobile telephone service through facilities such as this

Joint work of Bell and Independent people has made this service a reality in many parts of the country. On January 1, 1949, Bell companies were providing mobile telephone service in 133 areas, and Independent companies were providing service in another eight.

The area covered by a mobile service station is broad: approximately 20 to 25 miles in radius, on the average.

In many cases, therefore, it covers the exchanges of more than one telephone company. Thus the 133 Bell service areas include about 1,500 Bell exchanges and 1,000 Independent exchanges. Arrangements have been made for participation by all companies within such areas, resulting in a uniform service offering to the customers of all companies involved.

Complete and efficient mobile service coverage of a highway requires the spacing of stations without regard to ownership of exchanges. All companies along the highway work together in the basic planning to determine the most efficient location of stations, and joint decisions are reached regarding which companies are to provide the equipment and operate the various stations.

Television Networks

Television, which is rapidly developing in this country, introduces many new problems which require Bell-Independent coördination. Already there are more than 50 stations on the air. Another 400 are under construction or have applied for construction permits. A dozen television stations are presently planned in Independent exchanges. It is reported that over a million receiving sets are in use.

Broadly, the telephone company participation may involve facilities to meet administrative requirements, to connect the studio with the transmitter, to pick up local programs, and to connect with networks. Careful planning by Bell and Independent companies together is often required to serve this new industry adequately.

Extended-Area Service

Expansion of suburban areas, improvements in transportation, and similar factors have substantially increased the extent of many metropolitan areas. The same factors have likewise strengthened the ties between adjacent communities. To meet customer service requirements which result from these changing conditions, it is often desirable to replace short-haul toll service with flat-rate or message unit calling. This service is commonly termed "extended-area service."

Enlarged areas for extended-area service, in a number of instances, involve both Bell and Independent exchanges in a single project. In such situations, the division of ownership calls for joint decisions on such matters as determining the exchanges to be made a part of the extended area and developing the most appropriate services and rates for each of these exchanges.

Rural Development

The progress made since the war in improving rural service and development is another example of joint Bell-Independent effort. Since V-J Day, the Bell System alone has added more than 1,000,000 rural telephones.

One of the basic problems is adequate coverage of the widespread areas far from population centers, and both Bell and Independent companies are actively engaged in the development of less expensive ways of bringing telephone service to farms. Stronger wire has been developed, permitting longer spans and fewer poles; single pole-lines often carry both telephone and power circuits; power-line carrier equipment now permits telephone conversations to ride electric-power wires under cer-

tain conditions; even two-way radio has been used in some cases to reach farms in remote locations.

Such developments have contributed to the great progress since the war. The program is a continuing one, and Bell-Independent teamwork and interchange of experience will continue to make important contributions to the further progress to be achieved by the industry.

Bell Organization for Coördinating with Independent Companies

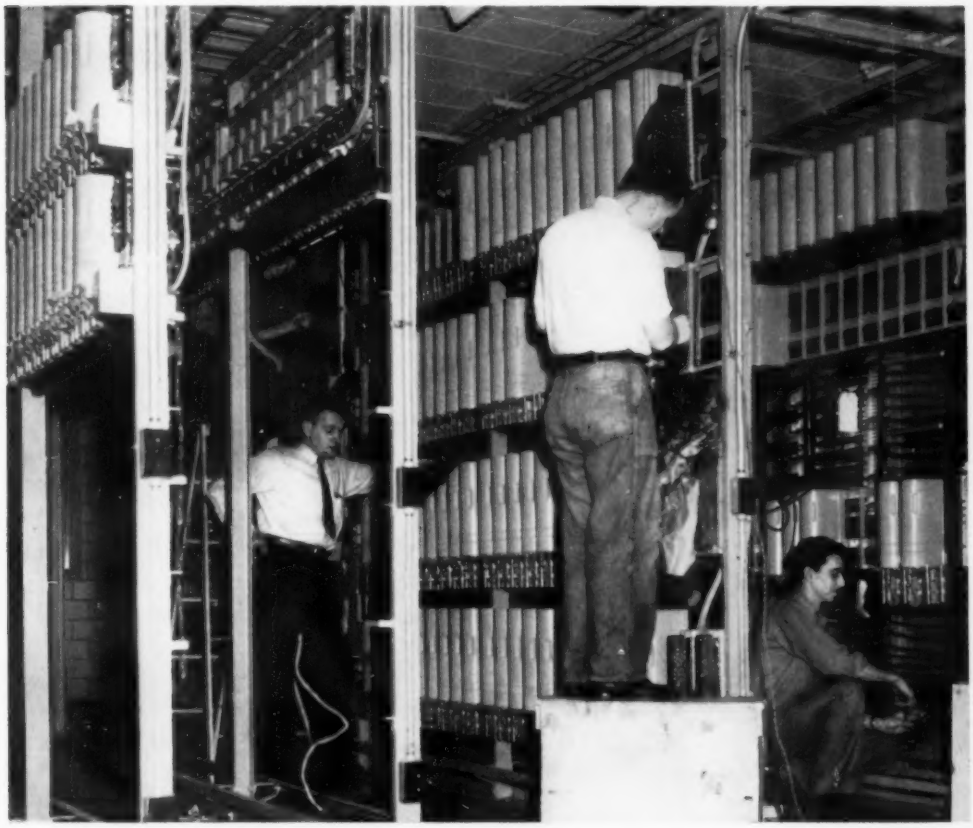
COÖPERATION between Bell and Independent companies is necessarily on an organized basis.

It is not possible to blueprint the job and organization, however, because there is considerable variation in requirements among the various Bell companies. Some factors affecting force requirements are:

The number and size of connecting Independent companies.

The range and amount of day-to-day work in coördinating Bell-Independent operations.

The activity and interest of Independent companies in dial conversions, mobile telephone service, operator toll dialing, and other new projects.



Rapid progress is being made among Independent companies, as well as in the Bell System, in the installation of dial equipment

The territorial characteristics of a Bell company may affect the degree to which the organization can be centralized. Bell companies operating in a single state or compact area have the greatest opportunity for centralization. Multi-state Bell companies usually require one group at general headquarters and other groups at state or division headquarters. Further decentralization is possible through delegation of some responsibilities to district managers and local managers.

Maintaining liaison with connecting Independent companies is a Commercial Department responsibility. The Commercial group charged with that responsibility also arranges for participation by other departments in handling individual problems as they arise. Representatives of the Engineering and Traffic Departments would participate in an Independent CDO project, for example. An Accounting representative might take part in a discussion of how best to maintain records covering interchanged business. Plant people participate in cases involving mobile telephone service and other services utilizing facilities of both Bell and Independent companies. Since several Bell departments are often involved in a single project, most Bell companies have committees for coördinating interdepartmental participation.

In most states the Independent companies have State Telephone Associations which are of assistance in matters affecting the Independent companies of that state. The Bell companies work with their respective associations on common problems. The United States Independent Telephone Association ("USITA") deals with matters affecting the entire Independent industry. Its activities include education and information and it deals with legislative, regulatory, and other matters of national importance to Independent companies.

SIX THOUSAND COMPANIES are providing a unified telephone service for our nation. The industry intends to keep it so.

The Bell System Makes Available upon Reasonable Terms, To All Who Desire Them, Non-exclusive Licenses under Its Patents, for Any Use

Bell System Patents and Patent Licensing

Keith S. McHugh

INVENTIONS originating in Bell System companies play an important role in the telephone business in this country. They also have extensive application in other industries. This article discusses Bell System policy in patenting its inventions and in licensing others to use them.

What is a patent, and why is it of direct benefit both to the inventor and the public? The granting of a patent under our law is in principle a simple exchange of values between the inventor on one hand and the public on the other. The public receives a clear, permanent and open disclosure of an invention which might otherwise be kept secret. The inventor receives on his part an exclusive right to his invention for the duration of the patent period (seventeen years in this country), which is intended to allow time to develop the product, get it into manufacture, market it, and derive a profit from it. At the end of this period anyone may use the invention freely.

The Bell System's interest in patents comes about both by the nature of its business and from the extensive work of research and development which it carries on in order to be able at all times to furnish the public the best possible telephone service. This activity of research and development is of long standing and is essential to satisfactory and continuing progress in the constant effort to find new and better ways of doing the job in an industry involving intricate apparatus and many complex operations.

OUT OF the research and development work carried on by Bell System scientists and engineers come many inventions. These inventions contribute significantly to the art of telephony and improved service to the user. Most of them originate in the Bell Telephone Laboratories, the System's

research and development organization. Some also originate in the American Company itself, in the Western Electric Company, the System's manufacturing organization, and in other companies of the Bell System.

It is the practice to apply for United States patents upon the more important of these inventions so that the Bell System's right to use its own inventions in furnishing communications service may receive the assurance provided by the patent laws.

Another reason for applying for patents on these inventions is that a patent establishes a right in an invention which enables the patent holder to grant licenses to others and thus to realize values of the invention in addition to the values derived from using the invention himself. Bell System patents often have a trading value in acquiring the right to use inventions of others which are needed in furnishing the best possible communications service; in fact, licensing others to use the Bell System's patented inventions is sometimes the only way by which such rights can be obtained. Beyond this, patents are valuable assets in that others often are willing to pay royalties for the right to use the System's patented inventions.

Some 600 license agreements under which rights are granted to more than 400 widely varied businesses are in effect. Negotiations are in progress with a number of other concerns, and requests for licenses are coming in steadily. Some of the important uses for which licenses have been granted under Bell System patents are telephone instruments and switchboards; submarine and other types of cable; loading coils, repeaters, and carrier systems; radio communications systems; broadcast transmitters and receivers; sound recording and reproducing apparatus; hearing aids; public address systems; and medical and scientific equipment.

IT IS the Bell System's policy to make available upon reasonable terms, to all who desire them, non-exclusive licenses under its patents, for any use. In order to realize the value of the inventions, it is necessary to employ different types of patent license agreements in different situations, of which the following are some illustrations:

(a) Licenses are exchanged with other patent owners, either with or without royalties, so that each gets the particular rights he desires under the patents of the other.

(b) Licenses are granted to manufacturers to make, use, and sell apparatus to others on a royalty basis.

(c) Licenses are granted on a royalty basis to those who desire to use specified apparatus in their own businesses (as distinct from those who sell such apparatus to others). Such licenses include the right to have the licensed apparatus made by anyone for the licensee.

Most of the System's license agreements fall within (a) or (b) above, or a combination of the two. For example, licenses are granted to manufacturers covering telephone systems and apparatus for sale to operating telephone companies, both Bell and non-Bell.

Where the proposed licensee has patents upon inventions which the System desires to use in the communications business, a non-exclusive license

under such patents is always expected and any difference between values involved is adjusted through royalties.

In all cases the System seeks to fix the terms of licenses to others under System patents, whether in the form of royalties or licenses to it, or both, in such a way as to be reasonably related to the value of the patented inventions covered by the license.

WHAT HAS BEEN SAID above relates to the licensing of concerns and individuals in this country. The same general philosophy applies to patent license negotiations with foreign concerns, although there are different conditions, such as patent and other laws, trade and currency regulations, etc., which must be considered in such negotiations. Proposed patent license agreements with foreign concerns are reviewed with the State Department to be sure that they are consistent with our Government's foreign economic policy.

For the general convenience of all those desiring licenses under Bell System patents, the Western Electric Company has been designated as the agency to make agreements for rights under all Bell System patents.

HAVE YOU ever stopped to ask yourself just what it is you really want in telephone service? I expect, when you boil it down, it's about as simple as this:

You want to get the person you are calling *quickly*, whether he's around the block or across the continent. You want to hear his voice *clearly*, and know that he is understanding you just as clearly. You want—and expect—your telephone service to be available to you 24 hours a day, and in using that service you want to feel that you are being treated in a friendly way by people who know their jobs.

And, of course, you want these qualities at reasonable cost.

Now the fact of the matter is, these are the very things we have always tried to give you. The aim of the Bell System has been—and is—to supply you with telephone service that is high in value, low in cost.

We intend to keep making it better all the time, so that its value to you will grow as your need for it increases.

An announcement on the Telephone Hour radio program.

"Civil Defense for National Security" Reports on the Steps Necessary to Minimize the Effects of Enemy Action Against the Unarmed People of this Country

The Part Communications Play in Civil Defense

Judson S. Bradley

THE SELECTIVE SERVICE LAW is in effect. The Army, the Navy, and the Air Force have been consolidated under one head, and are being strengthened in both personnel and equipment. A National Security Council, a National Security Resources Board, a Munitions Board, a Research and Development Board have been established and are functioning.

These steps are held to be essential, in this era of troubled peace, to the defense of our country.

Another step is essential to complete the nation's defensive organization: a structure of *civil* defense, to enable Americans to prepare to protect themselves and their productive capacity in the eventuality that war should ever be brought to these shores. And the need is greater now than ever in the past because of the indiscriminate and incalculable blows of modern warfare.

That step is in the process of being taken. Already there is a plan: a plan of Civil Defense for National Security.

Communications hold a key position, as would be natural, in the plan and in operations under the plan. But to understand their role, one must first understand what the plan includes, the organization it proposes, and the methods and extent of the organization's operations.

ON MARCH 27, 1948, the Secretary of Defense created an Office of Civil Defense Planning, and appointed to it a Director, who was instructed:

"To prepare and to submit to the Secretary of Defense a program of Civil Defense for the United States, including a plan for a permanent federal civil defense agency which, in conjunction with the several states and their subdivisions, can undertake those peacetime preparations which are necessary to assure an adequate civil defense system in the event of war."

By last Fall the assigned task was completed, and the Secretary of Defense made public on November 14 the 300-page document which the Director of Civil Defense Planning had submitted to him.

Civil Defense the report defines as "the mobilization, organization, and direction of the civilian populace and necessary supporting agencies to minimize the effects of enemy action directed against people, communities, industrial plants, facilities and other installations—and to maintain or restore those facilities essential to civil life and to preserve the maximum civilian support of the war effort."

The Civil Defense concept is essentially that of self-help, placing full responsibility for operation in the States and their communities.

The basic unit is the individual. Given information and training—first aid, fire prevention, detection of contaminated areas, and such—he must look out for himself.

The basic group is the family. With some or all of its members similarly trained, it too must take care of itself.

The basic organization is the community. Making use of existing municipal agencies, trained volunteers, and available skills and experience, it should, as a general proposition, undertake to meet whatever emergency befalls.

Only when confronted by a situation beyond its own capacity to handle would a community call upon the mobile reserves. These, set up on a scheme of mutual assistance, could be moved into an overwhelmed community from locations throughout a state or adjoining states. A mobile reserve unit would include provisions

for affording such services as rescue, medical, fire fighting, debris clearance, radiological defense, emergency feeding, and repair.

A disaster beyond the combined scope of the community and the mobile reserves would necessitate, as the ultimate recourse, calls upon the military services for assistance.

Implicit in the Civil Defense concept is also the availability of the organization for service in case of peace-time disaster, whether fire, flood, tornado, explosion, or other catastrophe.

The Civil Defense Organization

THE CIVIL DEFENSE PROGRAM contemplates a nation-wide peace-time organization which could be quickly expanded and made effective in the event of a national emergency. It would function—broadly speaking—along these lines:

A. There would be at the top a national Office of Civil Defense. Its head would be a Director, assisted by a staff and by four principal aides. The latter would be Deputy Directors in charge of Plans and Operations, Medical and Health Services and Special Weapons Defense, Technical Services (including Communications), and Training. This national organization would be and could remain small; it would exist primarily to furnish leadership and guidance in organizing and training people for civil defense tasks.

B. Regional offices, established perhaps on a geographic basis paralleling the Army Area Commands, would be in charge of Regional Coödinators, who would be responsible for coördinating Civil Defense matters between Federal and State organizations, and with the military and other agencies which might be involved.

C. Within each State, the responsibility for the operation of Civil Defense would rest with the Governor, who would appoint a State Director of Civil Defense. The latter would be assisted by an organization rather similar to that outlined in A above, coördinated with existing state governmental agencies; and his responsibility would be both to direct civil defense operations within the State and to coördinate them with those of other states and of the national organization.

D. The national and state organizations exist primarily in order that Civil Defense may function effectively at the *local* level. For that is where the blows of war fall: on people and places. It is important that Civil Defense make full use of existing agencies of local government, coördinating them with such added agencies as are not ordinarily found in normal peace-time local government. It is here, the report recognizes, that all Civil Defense planning meets its ultimate test: the handling of emergency conditions encountered at the local level—in the community—during actual operations. The local organization described in the report is intended simply as representative, since local circumstances may cause administrative needs to vary. As outlined there, the Mayor or comparable civic official would be the responsible head of Civil Defense at the level at which it would actually operate. He would establish an Advisory Council of representative citizens, and he would have reporting to him a Direc-

tor of Civil Defense, who would be assisted by four deputy directors. These four would exercise administrative supervision, respectively, over the following division:

1. Communications, Engineering and Public Works, Rescue, Transportation, and Air Raid Warning and Aircraft Observers;
2. Plant Protection, Warden Services, Fire and Police Services, and Mutual Aid and Mobile Reserves;
3. Radiological, Chemical, and other Special Weapons Defense, and Medical and Health Services;
4. Evacuation and Civilian War Aid.

All of these are coördinated, directed, and controlled by communications: communications of various kinds in various quantities, but all with a common requisite—adequacy and reliability.

"Fortunately," says the report of the Office of Civil Defense Planning, "in the United States there is a communications system of top efficiency and adaptability . . . all the varied segments of the American communications system are available and are willing to assist."

Communications' Role

FOR ADMINISTRATIVE PURPOSES, communications for Civil Defense are grouped in three classifications: General Communications, Radio Broadcasting and other Radio Services, and Air Raid Warning and Aircraft Observers Communications.

Taking them up in that order, let us think of general communications in terms of its most essential local use: at the local control center. The control center would be the place from which civil defense operations are directed in an emergency. Its communication facilities should be of the utmost efficiency and reliability, and adequate to all needs.

From the control center, wardens and emergency groups would be directed, and to it they would make their reports.

Here contact would be maintained with control centers of neighboring communities, to facilitate mutual assistance, and from here local civil defense units would be dispatched to help in organizing assistance.

The local control center would maintain direct contact with the local fire and police departments (although the departments should maintain their communication systems for their own exclusive use).

It would communicate with key radio broadcasting stations; and it would receive and transmit information concerning water supply, public utilities, transportation and evacuation operations, and radiological and chemical defense.

And it would receive and transmit air-raid warning information to designated officials and perhaps operate warning sirens and public address systems.

In general, existing telephone, telegraph, and radio facilities and services should be used insofar as possible; but provision should also be made for emergency means of communication. Those might include such means as mobile radio telephone, air-to-ground radio, walkie-talkie facilities, and messengers. Some or all of these would be essential during and after major attacks which disrupted

other forms of communication; for use during mass exacuation and by mobile reserve units; and for both air and ground reconnaissance after chemcial or atomic attack.

All existing communications facilities should be maintained by their owners; and expansion, repairs, and restoration should likewise be their owners' responsibility, plus such coordination and other assistance as Civil Defense might need to give.

Throughout the entire discussion of the vital importance of communications in the Civil Defense program, emphasis is placed on using standard equipment and arrangements wherever possible.

RADIO BROADCASTING is, of course, an important means of one-way communication.

Radio stations can be used in times of peace to inform the general public of its responsibilities under the Civil Defense program. In time of emergency, broadcasting of accurate and believable facts, warnings, and other information should contribute immeasurably in maintaining morale and preventing panic and confusion. Certain broadcasting stations would be designated to serve as master stations for the operational guidance of all other broadcasting stations within a given area. The use of broadcasting facilities would depend, however, on the extent to which and the conditions under which radio silence might be imposed for reasons of military security.

Under a carefully organized plan, amateur radio operators should be capable of making important contributions to civil defense, by providing supplementary emergency communications channels—especially after an attack. Study of this nation-wide resource is proposed as a part of the Civil Defense program.

THE AIR-RAID WARNING SYSTEM of the Civil Defense program would be dependent upon the military air defense for news of impending air attack, which it would pass on in turn to key individuals and, through its local control centers, to the public. Civil Defense could also make constructive contributions to military air defense, particularly through civilian aircraft observer activities.

The U. S. Air Force has established an Air Defense Command, to defend this country in the air. It will have an air defense control center in each of the air defense control areas it will set up to cover the country; and each such control center will have communication facilities to connect it with all sources of information about air activity in the area.

The air defense control center will be operated by the Air Force, but it would also be the operating center for a Civil Defense air-raid warning chief. Because he would be right in the middle, he would have instant access to all information about air attack, to pass on to Civil Defense organizations. To the extent that they met his needs, each air-raid warning chief would make use of regular commercial telephone facilities. Other possibilities include printer telegraph equipment standing by to transmit pre-punched warning codes, and the transmission of secret codes from radio broadcasting stations by means of sub-audible frequencies.

Despite modern electronic warning equipment, a supplementary system of

civilian aircraft observers will undoubtedly be needed to assist the Air Force in maintaining effective air defense and air raid warning operations. The local Civil Defense organization should be ready, in coöperation with the commander of the area air defense control center, to recruit and organize the aircraft observers and to select the observation posts. Since all this would have for its purpose the instant reporting, to the proper air defense control center, of aircraft seen or heard, the means of communication would be of prime importance. It would be the responsibility of the chief of the communications division of the Civil Defense organization to determine what those means should be and to see that they were planned in advance and made available against the need.

The Planning Goes Ahead

PENDING SUBMISSION of the report "Civil Defense for National Security" to the Eighty-first Congress, the small Civil Defense Planning group which prepared it continues with the preparation of plans and training material.

Action by the Congress could quickly create within the Federal government an Office of Civil Defense which would make effective the recommendations of the report. This organization would function on the national level, as outlined earlier, in assisting the states to establish their own organization and thereby encouraging the local communities to establish theirs.

As these steps were taken, communications would come more and more into the foreground of the picture. Until then they, like other proposals of the report, rest largely at the planning stage.

The planning has been serious and realistic. Representatives of the communications industries have been active in the preparation of the report, and numerous others have been members of the advisory panel on communications services. As a consequence, the communications companies are fully aware of their responsibilities and prepared to meet them.

"The United States is fortunate in having the most extensive and finest communications system in the world," says the report of the Director of Civil Defense Planning. Only a few years ago, that system demonstrated its capacity to assume vast burdens in contributing to the military victories of this nation. It demonstrated, at the same time, its potentialities for Civil Defense. They are even greater now.

Newspapers throughout the country hailed "Civil Defense for National Security" as a report of first importance, and paid their respects to the patriotic and disinterested Americans who devoted their time and energy to its preparation. Perhaps it will be sufficient here to quote from the *New York Times* of last November 14:

"We commend [the plan] to Congress and to all citizens as a reasonable and important document. . . . The sooner a Civil Defense act is passed here and put into effect, the better it will be. This is an act of prudence that should not be long delayed."

The Pace farm, near Burlington, North Carolina

The Millionth Bell Rural Telephone Since the War Is Installed

THE MILLIONTH RURAL TELEPHONE to be added by the Bell System since the war was placed in service by the Southern Bell Telephone and Telegraph Company last December 16 in the farm home of W. J. Pace, in the bright-leaf tobacco section of North Carolina, thirteen miles from Burlington.

With the addition of these million new telephones, there are now more than 2,300,000 Bell System telephones serving rural areas: 65 percent more than there were on V-J Day. As a result of the record performance of the Bell Companies and the active rural building programs of other telephone companies, about 45 percent of the farms of the country now have telephone service.

The first call from the new telephone was made to President Harry S. Truman in Washington by U. S. Senator J. Melville Broughton of North Carolina, who introduced Mr. Pace to the Chief Executive.

Other participants in the ceremonies at the Pace farm included W. Kerr Scott, governor-elect of North Carolina, himself a farmer and dairyman, who spoke by telephone with Leroy A. Wilson, president of the American Telephone and Telegraph Company in New York. Mr. Pace also talked with Mr. Wilson. Also present were other state government officials, agricultural leaders, and representatives of the telephone industry, including Hal S. Dumas of Atlanta, president of Southern

Bell Telephone and Telegraph Company, and Frank S. Barnes of Rock Hill, S. C., president of the United States Independent Telephone Association.

During the ceremonies, Governor-elect Scott characterized the installation as symbolic of the progress being made in eliminating the isolation of the farmer. "Good roads, electricity, and telephones are not luxuries for the farmer; they are necessities," he said.

Mr. Dumas said that the Bell Companies would continue to push their rural expansion and improvement program, but emphasized that large amounts of money would be needed to do the job. "The rural telephone expansion program,* undertaken by the Bell System in 1945 when men and materials again became available following the war, called for the addition of a million telephones in rural areas within five years," he said.

"This was the first postwar step in resuming the active extension and improvement of service in rural areas. The job has been done in a little over three years despite serious shortages of supplies of all kinds.

"To accomplish this task meant adding rural telephones at the average rate of more than 1,000 every working day—over three times the rate of any previous period in Bell System history.

"The attainment of the Bell System's initial postwar objective does not mean that the task of bringing service to rural America is finished. The work will go right on," Mr. Dumas said.

* See "More and Better Service for Farmers," MAGAZINE Winter 1944–45; and "Progress in Extending Bell Rural Telephone Service," MAGAZINE Winter 1946–47.

Mrs. Pace uses the new telephone as husband and granddaughter look on

Operation of the New York and Chicago Toll Crossbar Switching Systems Represents the Latest Word in Machine Handling of Long Distance Traffic

Toll Dialing by Operators Reaches Some 300 Places

Ernst J. Guengerich

THE BELL SYSTEM made its biggest forward step in toll dialing with the cutovers last December of the toll crossbar systems in New York and in Chicago.

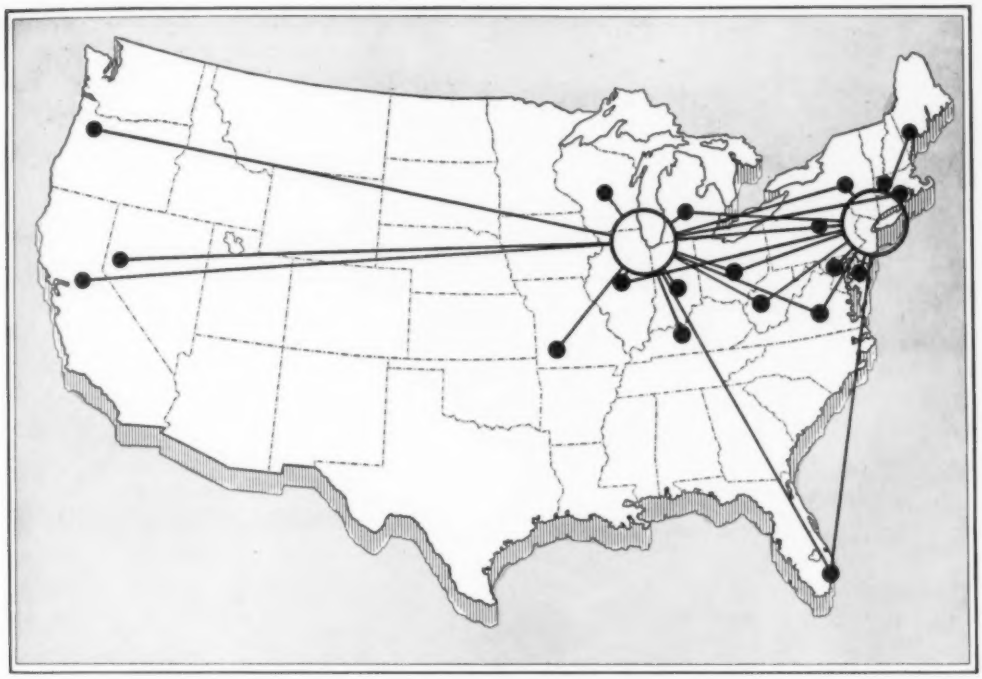
These mechanical switching systems are like local dial offices in many respects; but, instead of serving local customers and handling local calls, they serve toll operators and handle toll calls. Outward toll operators in New York and Chicago now dial through their toll crossbar systems to reach customers in distant cities. Operators in distant cities dial customers in New York and Chicago, and also switch through the New York and Chicago toll crossbar systems to reach other cities. In other words, a toll crossbar system acts as a tandem board for outward calls, as an inward board for incoming calls, and as a through board for completing switches through a switching center such as New York or Chicago.

The name "toll crossbar" comes from the use of the crossbar switch for setting up connections and certain distinctive toll features which distinguish this system from others, such as step-by-step and crossbar tandem, which also are used for toll dialing. Toll dialing replaces the "ringdown" method of handling toll calls, under which an operator rings on a toll circuit to attract an operator's attention in the distant city, asks for a local number or for a circuit to another city, and, on through calls, rings again at the end of conversation to have the connection released.

Under the toll dialing method, the operator dials or "key pulses" a series of digits which actuate dial equipment to reach the called number, and all connections are released automatically when the operator disconnects.

Historical Background

THE STUDY of an improved toll switching system began shortly after the end of World War I, to meet the



States connected with the New York and Chicago crossbar toll dialing systems

urgent demand for better means for handling toll traffic in the larger cities.

The first approach was a dial system using panel equipment, and a trial installation was made in Seattle, Washington, in 1925. This system, which is still in service, permitted nearby points to dial Seattle numbers, but the operation was slow and the possibilities for general use did not warrant further study.

A study was then made of straightforward toll circuits with high-speed manual switchboards: an arrangement similar to the trunking arrangement between local manual offices in a multi-office city. Under this system, when an operator takes up a trunk, a signal automatically lights at the distant office; and when she disconnects at the end of conversation, she sets a release signal. A four-position switchboard similar to a local B board was tried out in New York City in 1935, and experience with it showed that considerable improvement could be made in manual toll operation.

By this time it appeared, however, that a dial system might be developed which would not cost a great deal more, and that the real answer lay in complete mechanization. Development was directed to toll dialing, and the design of the toll crossbar system as we know it today began to take shape.

At that time, the range of toll dialing was limited to a few hundred miles and it was expected that ringdown or straightforward operation would continue for many years over the longer circuits. Provision was made, therefore, for handling traffic

Operators at a toll switchboard in New York. The girl in the foreground is using the keys which take the place of the dial. Beside them is the bulletin listing the codes for frequently called points

from such manual circuits by developing the No. 4 switchboard as an auxiliary feature of the toll crossbar system. Completion of development work was delayed by the beginning of World War II, and the first toll crossbar system was not placed in service until the one in Philadelphia was cut over in August 1943.*

The Philadelphia system provided for completing outward, inward, and through calls by operator dialing or key pulsing, as well as for the completion of calls to and from manual ringdown and straightforward trunks. A No. 4 board was included for handling calls from the manual trunks and for giving assistance to operators in other cities when difficulty was met in dialing a number. The toll crossbar switching systems now serving New York and Chicago are of the same type as the one in Philadelphia except that no No. 4 boards are provided. Straightforward operation has been dropped, dialing now is practical over any distance, and the program for converting ringdown circuits to dial is expected to move so rapidly that new No. 4 switchboards for ringdown trunks would have a relatively short life and therefore would not be justified.

The Toll Dialing Network

WHEN THE Philadelphia toll crossbar system was placed in service, it was the center of a toll dialing network of some 30 toll centers, the most distant of which was Richmond, about 250 miles away. Most of the others were within a radius of 100 miles of Philadelphia.

New York, Chicago, and Philadelphia now are part of a greatly expanded toll dialing network which includes 125 toll centers, each of which has a number of tributary com-

* See "A Dial Switching System for Toll Calls," MAGAZINE, Winter 1943–44.

munities also reached by toll dialing. These are scattered across the country from as far south as Miami and as far west as Sacramento, Cal., and Portland, Ore. Operators in these 125 toll centers now are completing calls to a total of some 300 cities and towns within the network by dialing over direct circuits and through switching centers.

In this network, New York, Chicago, and Philadelphia are the key switching centers. These tie together the self-contained dialing networks covering limited areas which have been in operation for a number of years in Eastern Pennsylvania, Virginia, Ohio, and elsewhere.

The No. 5 Switchboard, for handling calls which cannot be dialed through the equipment. This type of board, which handles calls from operators, corresponds to the local DSA board for handling calls from customers

Equipment Features

A TOLL CROSSBAR SYSTEM consists of two basic parts.

I

One is a series of frames and crossbar switches on which are terminated the various trunks which are to be connected. These consist of tandem trunks from outward positions, toll circuits to and from other cities, toll switching trunks to local offices in the city where the toll system is located, and trunks for reaching Information, Delayed-Call, and other assistance operators. Paths or links are provided between these frames for connecting tandem trunks to toll circuits on outward calls, for connecting toll circuits to switching or operator trunks for incoming calls, and for connecting toll circuits to other toll circuits on through calls.

An incoming and an outgoing trunk on these frames, and the links connecting them, are in use until the end of a conversation. The frames and crossbar switches on which the trunks are terminated correspond to the an-

swering jacks and multiple of a manual toll switchboard, and the links between the frames correspond to the cords used by an operator in establishing connections.

II

In place of an operator, however, a toll crossbar system has "control" apparatus which establishes the connection. This control apparatus is the other basic part of the toll crossbar system.

It consists of controllers, senders, markers, and other equipment whose function it is to receive an order in the form of electrical pulses, to set up the required connection to the proper trunk, and to pass along any further information in the form of electrical pulses which are needed to complete the connection in the next office.

This equipment is in use only from the time an operator takes up a trunk to the crossbar system until the connection is established. The length of time a sender is held ranges from about 8 to 12 seconds, and the holding time on controllers and on markers is measured in fractions of a second. As soon as the control equipment has finished setting up one call, it is ready for the next one.

This division of the toll switching system into two basic parts—frames with connecting links, and entirely separate control apparatus—is necessary in order to make most effective use of the costly toll switching equipment and to obtain the necessary flexibility in operation.

IN ADDITION to the dial equipment in the New York and Chicago toll crossbar systems, special switchboards known as No. 5 boards are provided for handling calls which cannot be dialed through the equipment.

The No. 5 board corresponds to the DSA board used in local dial offices for handling assistance traffic from customers. The No. 5, however, has double plugs and twin jacks in order to provide the same grade of transmission on calls completed at the switchboard as on calls dialed through the machine.

Besides trunks from and to the dial equipment, the No. 5 board has special facilities by means of which an operator can tell when all the toll circuits in any group are busy and when one or more circuits are idle. This indication helps the No. 5 operator complete calls that have been delayed by a "No Circuit" condition on which an outward operator has requested assistance.

Each position is equipped with a key set of ten keys, numbered 1 to 0 and bearing the same letters as on a telephone dial. There is a separate "key pulsing" key which is operated first to connect the key set with the cord the operator is using, and another key which is operated after the digits of the desired number have been pulsed to indicate to the machine that no more digits are coming. These key sets take the place of the dials generally used on the smaller DSA boards.

How Calls are Handled

THE CUT-OVERS of the New York and Chicago toll crossbar systems made no change in the way customers place their toll calls, but it did change the method operators in these and other cities use in completing such calls to points in the toll dialing network.

When an outward operator in Chi-

cago, for example, receives a call for a New York number, such as PEnnsylvania 1–2345, she takes up an idle tandem trunk to the machine and "key pulses" the code "212" followed by two letters of the office name and the remaining digits, 1–2345.

The control mechanism in Chicago uses the code "212" to select an idle circuit to New York, and pulses the called number forward into the New York switching system.

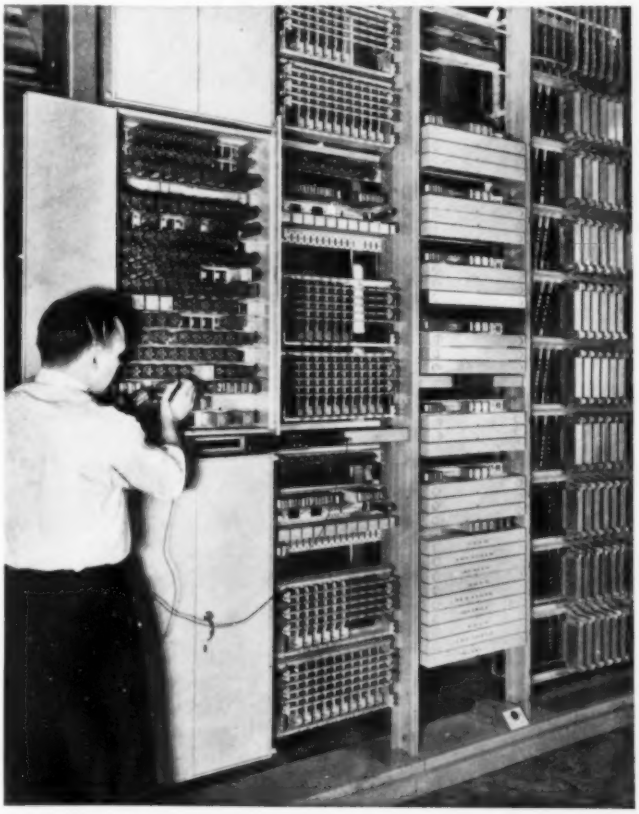
The New York machine uses the code "PE 1" to select an idle trunk to the PEnnsylvania 1 office, and transmits the remaining digits to the local office.

The dial equipment in the local office sets up the connection and starts ringing the called number.

The key set on the outward position with which the operator key pulses the code and number is similar to the one on the No. 5 board already described. The operator obtains the code for New York, "212," from a position bulletin which lists the codes for frequently called points. If the operator receives a call for a point not on the position bulletin, she refers to the route desk for the needed information.

If the called telephone is busy, the busy signal is received by the Chicago operator and by the customer. The operator disconnects and makes another attempt a few minutes later. When the Chicago operator disconnects from the tandem trunk, the whole connection is released—including the links in the Chicago machine, the New York circuit, the links in the New York machine, the switching trunks to the PEnnsylvania 1 office, and the equipment in the local office.

If the call had been placed without the called number, the Chicago operator would have first reached the New York information bureau. She does this by key-pulsing the code "212" as before to reach New York and then "131," which is the universal toll code for information. Having ob-



Dial senders and marker connectors: essential parts of the control apparatus of a toll crossbar system

tained the number, the Chicago operator disconnects and again pulses the New York code followed by the number. The procedure is the same as when a customer dials information, learns the number, hangs up, and then dials the number.

When a Chicago customer reports that he is ready to talk on an incoming call by saying, for example, "New York operator 681 is calling me," the Chicago operator pulses the New York code 212 followed by 11–681. The New York machine on receipt of the digits 11–681 connects with operator 681, who has the original ticket and who will then complete the connection. The digits "11" are prefixed by the operator who handles the report in all cases when a connection is to be made to an outward delayed-call operator.

A CODE, such as 212 for New York, is assigned to each direct circuit group connected to a toll crossbar system. Dialing is not limited to direct circuit points, however, and codes also are listed on the switchboard bulletin for points reached over built-up circuits.

If a Stamford, Connecticut, operator receives a call for Chicago, CAlumet 4–1234, she finds from the bulletin that the route is "New York 312 + 2L." This tells the Stamford operator that she should take up a New York circuit and dial 312 followed by two letters of the office name and the called number. The digits 312 are used by the New York machine to select a circuit to Chicago. The digits CA 4 are used by the Chicago machine to select a trunk to the CAlumet 4 office, and, finally the digits of the called number, 1234, are used by the local dial system to reach the desired telephone.

The Stamford operator actually dialed the code and number, since the Stamford switchboard is equipped with dials rather than with key sets such as are used in New York and Chicago.

In the example just described, if all of the circuits from New York to Chicago had been in use, the Stamford operator would have received a slow flash called the "overflow" signal on a cord of her position. When a circuit becomes free, the signal changes to a rapid flash, called the "re-order," and the operator disconnects and dials the code again. In the event that all circuits again become busy between the time the re-order signal was received and the Stamford operator dials the call again, Stamford again receives the overflow signal. Experience has shown, however, that in a high proportion of cases an operator does secure a circuit after receipt of a re-order signal.

THE CALLS described so far have all been between dialing points, but many cities have not yet been converted to dial operation or have not yet been connected to the dialing network. Arrangements have had to be made, therefore, to connect toll offices equipped for toll dialing with points still reached over ringdown circuits.

For example, on a call from Stamford to Pittsburgh, which can be reached only over ringdown circuits, the Stamford operator takes up a circuit to New York and dials the code "122" as shown on her bulletin. On receipt of this code the New York machine connects a trunk to a manual

tandem operator in New York who has direct access to the Pittsburgh circuits in the multiple. When the tandem operator is connected, the Stamford operator hears an "order" tone and passes the order for a Pittsburgh circuit. The tandem operator connects to an idle circuit, which is rung automatically; and when the Pittsburgh operator answers, the call is completed in the manner usual under ringdown operation.

On a call in the reverse direction, from Pittsburgh to Stamford 3–1234, connection has to be made from a ringdown circuit to a city which can be reached from New York only by dialing. In this case the Pittsburgh operator takes up a circuit to New York, as indicated on the switchboard bulletin, which shows the route to Stamford as "Via New York." When the New York operator is reached, Pittsburgh asks for Stamford and New York replies with the phrase "Dialing." This indicates that the New York operator dials Stamford numbers. Pittsburgh gives the Stamford number, 3–1234, to the New York operator, and she takes up a tandem trunk to the machine and key-pulses the Stamford code 057 fol-

Frames with crossbar switches for terminating incoming and outgoing trunks in a toll crossbar system

lowed by the digits of the called number.

The Stamford code and the fact that Stamford is reached over dialing circuits are shown on the switchboard bulletin at the New York "through" position. The New York machine, on receipt of the code 057, connects with a Stamford circuit and transmits the called number 3–1234 to the Stamford dial equipment, which makes the connection with the desired telephone.

At the present time, the New York and Chicago toll crossbar systems are limited to dialing a maximum of 14 digits, which is enough for all direct and one-switch calls. When a call requiring two or more switches and more than 14 digits is involved, which happens on two or three percent of the traffic, it has to be passed to an inward operator at an intermediate office for completion. The "Inward Operator" code "121" is used for this purpose as well as for other cases where an outward operator requires assistance at a terminating or at an intermediate office.

*Advantages of Toll Crossbar System**

THE ADVANTAGES of the New York and Chicago toll switching systems in speed of completion, dependability, uniformity of service, and prompt release of circuits at the end of conversation are similar to the advantages of local dial service as compared to manual operation.

On those toll calls which are completed by the toll dialing method through these switching systems, machine handling of tandem, through, and inward connections improves the over-all speed of service by 10 to 30 seconds.

Since the cord connections inherent with ringdown operation at the tandem board and at distant offices are eliminated, the hazards of accidental interruptions or of cut-offs are greatly reduced.

Service is more uniform, because sufficient equipment is provided to handle the calls expected during the busy hours of the busy season and it is all available 24 hours a day and every day of the year to handle unexpected peaks in off hours.

As the hang-up of the customer releases the connection at once in local dial operation, so the disconnect of the outward operator on dialed toll calls releases the toll circuit and all of the equipment connected. The decrease in connection time and faster release at the end of conversation is expected to bring about a corresponding decrease in toll circuit requirements.

In Chicago and New York, about 20 and 30 percent respectively of the toll circuits are now connected to the toll crossbar switching systems. These percentages will increase rapidly as other crossbar systems are installed during 1949 in Cleveland, in San Francisco-Oakland, and in Boston, and toll dialing equipment of different type is provided in other cities. Further installations are planned for future years.

Outlook for the Future

THE NEW YORK AND CHICAGO toll switching systems at the moment represent the latest word in machine han-

* See "Operator Toll Dialing: A New Long Distance Method," MAGAZINE, Summer 1944; and "Operator Toll Dialing: The Coming Way," MAGAZINE, Winter 1947–48.

dling of long distance traffic. However, development of new features is well under way, and it is expected that in a few years a nation-wide toll dialing plan can be placed in effect which will do away with the present limitations and ultimately will make it possible for a toll operator anywhere to dial a telephone in any other city in the country. These new developments will provide automatic alternative routing in case all circuits on the first route are busy, and will employ a nation-wide numbering plan which will greatly simplify the routing of calls and reduce the number of digits required for any call to a maximum of 11.

When these new facilities are placed in service, it is expected that the handling of toll calls by operators will be substantially as fast and as convenient as the dialing of local calls by customers.

Rural Telephones

THE ANNOUNCEMENT THAT THE 1,000,000th Bell System rural telephone to be added since the war has been installed in a North Carolina farmhouse calls to public attention the speed with which the telephone company has moved in recent years to extend and improve telephone service. Soon after the end of the war in 1945 the Bell System set up a goal of 1,000,000 rural telephones in five years. The job has been done in only a little more than three years despite serious shortages of all sorts of supplies.

Fulfillment of such a task meant that rural telephones had to be installed at the rate of more than 1,000 every working day, more than three times the rate of any previous period in Bell System history. Vast amounts of materials and equipment were required. One and one-quarter million telephone poles had to be erected, while the length of telephone wire required—about 500,000 miles—was enough to stretch around the earth twenty times.

As a result of the work by Bell System companies and the active building programs of other telephone companies the number of American farm homes that now enjoy the benefits of this service is impressive. It is estimated that about 45 per cent of the farms of the country have telephones, more than at any time in the nation's history. This compares with 32 per cent at the beginning of 1945 and 25 per cent early in 1940. Still the task is far from finished; the work goes on, and we are assured that future progress will be rapid.

From the New York Times.

Fair Exchange

John Mason Brown

HE HAD DONE IT the year before with the spring of a clock. By wire from one room to another he had managed to transmit a twanging sound. Then on March 10, 1876 (oh, noteworthy date which our children often make regrettable), Alexander Graham Bell took the next step forward. Also by wire he at last succeeded in sending his own voice from one room to another. He was able to cajole his little contraption into conveying a single sentence.

The sentence was full of urgency and business, and as brief as all of us think other people's phone calls should be. "Mr. Watson, come here, I want you." That was all. No hellos, no goodbyes, no talk about the weather, no chitchat, no gossip—the perfect, if abandoned, model for all subsequent conversations transmitted by such means. But the telephone was here to stay, adding to the blessings of mankind and the problems of parents. If its coming has caused the world to shrink, it has also diminished the chances fathers and mothers might have of talking to their friends, once their young reach the age when they, too, discover the telephone.

It is we, the parents, who speed this discovery. For our vanity we pay heavily. Moreover, we deserve to. When they, the children, are what the garment-makers and the whimsy-manufacturers refer to as tiny tots (whose heads are as yet undersized for telephonic needs), we think it cute to lift them on our laps, to hold the receiver first to their ears, then to cup the mouthpiece to their lips, nudging them all the while into terrified talk with Granny or Grandpop, with Uncle P. or Cousin Joe.

We do this wreathed in smiles, but prodding arduously, prompting anxiously, on feast days or on anniversaries when long distance has annihilated geography. We do this when such epigrams as "Mewwy Chwistmas, Gwanny!" or "I'se fine. Is you?" travel a thousand miles, demanding the services of how many linemen, operators, and technicians Walter Gifford only knows. Little do we realize that, by having done this, we have undone ourselves.

In contemporary life the mastery of the telephone is a proof of the approach of age. Like the first tooth, the last diaper, and the formula no longer needed; like those great moments when rolling over is transformed into crawling and crawling into perilous steps; like those releasing days when shoelaces and neckties can at last be tied and handkerchiefs used with accuracy; like those genuine occasions when the scooter succeeds the velocipede and the bicycle ousts the scooter; when parents' freezing arms are replaced by waterwings and waterwings by breast strokes; or when play school turns into day school, and short pants into long, the full uninhibited employment of the telephone comes as a milepost on the difficult path to growing up.

"He is very good at the telephone," we say of a seven-year-older, meaning that he can take messages with as much accuracy as the operator of a hotel switchboard. Although this may be true, all things considered it is the most niggardly of praise. The stubborn fact is, however, that the children we go to such pains to initiate soon take over.

At breakfast or after school hours and during the whole of their vacations when they are home, they cannot be pried away from the telephone. A receiver becomes their third ear; a mouthpiece, their extra

lip. Where formerly they functioned as ventriloquists' dummies for our guiding whispers ("Say, 'How are you, Grandpop?'"; "Say, 'Thanks for the present'"; "Say, 'Love to Granny'"; "Say, 'I had a very nice time'"), they blossom suddenly into filibusterers. They could not talk with more relish, at greater length, about less on the phone if they were adults. Before you can say Alexander Graham Bell, they own the controlling stock in the household installation.

MY YOUNGER BOY, being seven, is not yet an habitual dialer. Even so, he has his fun with the telephone. It ranks high among his toys. Our mounting bills indicate that he has a train-dispatcher's interest in time. Not time as it remains stationary on his battered and unwound alarm clock. No, time as it is considerately vocalized by the telephone company for those without sundials or watches. He never tires of the voices, melodious or metallic, which merely by dialing ME 7-1212 can be provoked into announcing, "When you hear the signal," etc. What is far worse from the point of the family budget, he has long since learned that he can get the same results by trying NERVOUS. Luckily, his interest in the weather has not as yet become as great as his interest in time, and WE 6–1212 has not taken its place among his private numbers.

He has his serious uses for the phone—birthday parties, motion-picture dates, and occasional, very abrupt conversations with his contemporaries. These consist mainly of "Yes," "No," "Why," "Sure," and "When." As a rule, in spite of all admonitions, they end with the replaced receiver serving as a substitute for a more courtly "Goodbye."

My eleven-year-old boy has, like his friends, reached years of greater communication on the telephone. They call each other incessantly at all hours on matters which, to them, are never trivial. Subjects as imperative as tomorrow's homework; who has mumps, measles, or appendicitis; who got what prize from what cereal; who listened to which radio program; who has read what comic; who has heard from Charlie Atlas; or how much fishing tackle or bicycle equipment has arrived from Sears-Roebuck—all these are topics of interminable interest which keep me and the wires burning.

Youngsters do not salute each other on the phone the way their elders do or, for that matter, the way their elders would like them to. I can't help shuddering when I hear my older son greet a friend with a curt, "Hello, whadda ya want?" Nothing more than that, though the friend may have nothing more unfriendly on his mind than to invite him for a week-end or to a birthday party. I shudder with equal violence when, instead of mustering a "Thanks," he says, "Well, so long. I'm listening to Henry Morgan."

MY WIFE AND I already sense that, so far as our telephone is concerned, we are fighting a losing battle. What we are now surviving are, of course, only preliminary skirmishes. Our telephone will not be entirely lost to us until, one inevitable afternoon, we hear one of our boys, in an unreliable voice, whisper "dearest" or "darling" into our phone.

We may regret it when our young have sprouted to the point where our telephones become theirs. But let any of us hear their voices when, from a friend's house, they are calling us at home, or we are long-distancing from a journey, and all is forgiven. No letters, however eloquent, can say what their young voices say merely by being heard. When they speak unprompted; when the talk is at last two-way; when the interchange of ideas and interests is genuine, then Bell becomes our hero, and all those bills sent in by his company dwindle into insignificance.

Drama critic, war correspondent, essayist, Mr. Brown is an associate editor of "The Saturday Review of Literature"—from which publication the foregoing is reprinted in part, by permission.

Negotiations before Construction Provide Routes over Privately-owned Property for the Long Lines Department's Nation-wide Telephone Network

Right-of-Way Comes First

Harry H. Hoopes

DURING 1947 the Long Lines Department of the American Telephone and Telegraph Company engaged in purchasing rights of way in 17 States for 25 new main telephone lines and six branch lines which total 3,368 miles in length. The lines were constructed generally on privately owned land. To build a telephone line on other peoples' property is a privilege, certainly. How is that privilege obtained so extensively?

It is obtained by men whose title defines their work: Right-of-Way-Men. For each individual property crossed by the line, a separate negotiation by a Right-of-Way man is required to secure the necessary right of way. In the Long Lines Legal Department are half a hundred of these employees, working out of Division Headquarters offices throughout the country, whose responsibility it is to obtain, as not only a privilege but a purchased right, the essential permission which must precede construction.

When a new line is to be constructed, the first step is the selection of a tentative route by the Engineering Department, usually from road and topographical survey maps. Naturally, the shortest practicable route between key cities is selected. After it has been drafted on the maps, representatives of the Engineering Department drive over the roads nearest the route, to make a preliminary investigation of the physical nature of the land.

If the selected route looks feasible, aerial photographs showing the area involved are usually ordered from the Department of Agriculture, which has an aerial survey of a large part of the United States. There are, however, some sections that have not yet been photographed; and if the route crosses the area where photographs are not available, or where existing photographs are out of date, the company often has commercial aerial photographers take pictures of the section.

As soon as the aerial photographs are obtained, they are turned over to

the Right-of-Way Men, with the tentative route indicated on each print. The prints furnished are about 24 inches square and are photographed to a scale of 660 feet to the inch, so that each print covers about three miles of line. The detail on these photographs is quite remarkable, showing the roads, streams and waterways, woodland, all intervening fence lines, and buildings. Obviously, they are a great help to the Right-of-Way Man in negotiating for the rights of way. The property owners too are usually very much interested in seeing an aerial photograph of their property.

Fortified with these photos, the Right-of-Way Man is prepared to proceed with his job of securing the rights of way.

Before approaching the owners, the company makes a careful investigation of the nature of the property, land values, and other considerations, in order to determine a fair and equitable price to be paid for the right of way. This price is based on a certain sum per pole, if a pole line; or per lineal rod (16½ feet), if a buried cable. It is important to treat all property owners along a given section of a line alike. There are a few unusual circumstances which in some

A tentative long distance route as drawn on an aerial photograph. Even as reduced for publication, river, roads, buildings, woods, and fields are clearly distinguishable

cases justify a different rate of compensation.

Securing the Options

THE FIRST PHASE of securing the rights of way is the "optioning."

It is the custom of the company to take only an option on the initial contact, for which a nominal consideration is paid. This instrument provides that, if and when the option is exercised, the company will pay the balance of the price agreed upon. This practice was adopted as a precautionary measure; in the event that the cable route is changed and the property is entirely avoided, only the nominal consideration paid for the option is expended.

At the time the option is taken, the Right-of-Way Man is just feeling his way along. First, he must ascertain the name of each property owner and his place of residence, if not on the premises. Then, when the owner is located, in addition to securing the option, he must obtain other information regarding the location of property lines, names of adjoining owners, information regarding liens against the property, and other data, if possible, for checking titles. The County records are searched, to trace ownership down to date on each property. This search may, and not infrequently does, disclose that there are outstanding interests about which the Right-of-Way Man was not informed.

After a substantial section of the line has been optioned, the Engineering Department is advised, so it may proceed with an investigation of the physical nature of the land on each property. In this way the most desirable location for the line is finally selected. Once this has been done, the route is immediately surveyed, measured, and staked. The measurements are then converted into station numbers, which are inscribed on the stakes. From these station numbers the Right-of-Way Man can ascertain the exact distance across each property, thereby determining the amount due each owner for the right of way.

THE JOB of having the final grants executed represents a tremendous amount of work. The complex titles in many cases involve property in which the fee is vested in unsettled estates. Frequently, minors or incompetents are involved. In such cases guardians must be appointed, and court approval must be obtained for the guardian to execute the grant.

Locating and communicating with non-resident heirs presents another difficult problem; sometimes the address of a non-resident is not known. In addition to having the grants executed, there are releases which must be secured from holders of liens against the properties involved. Certificates of acknowledgment must be executed by authorized officers for each signature, so that the instrument may be placed on record. In some estates, from ten to twenty heirs may be involved, and they may be scattered throughout the United States; nevertheless, all these persons must be reached to execute the grant in order to close one property of perhaps only a few hundred feet.

Construction Begins

AFTER the final grants are taken, the construction work gets under way. The first step is clearing the right of way. For a typical coaxial cable job,

REGISTER No.

together with the following rights, ... and across the lands ... and from said strip for the purpose of exercising the rights herein granted, ... surface markers beyond said strip; to clear and ... cleared all trees, roots, brush and other obstructions from the surface and subsurface of said strip and within seven feet thereof; to install gates in any fences crossing said strip; and to permit in said strip the underground cables, wires and circuits and appurtenances of any other company. The easterly boundary of said one rod strip shall be a line parallel to and FIVE feet East of the first cable laid, which cable shall have its location indicated upon surface markers set at intervals on the land of the undersigned or on adjacent lands. The undersigned for ... selves ... and ... their heirs, executors, administrators, successors and assigns, hereby covenant that no structure shall be erected or permitted on said strip. The grantees agree to pay for damages to fences and growing crops arising from the construction and maintenance of the aforesaid systems.

Signed and sealed this 17, day of December, 19 47, at Platte City, Missouri.

Witness:

Alma Hancock (Seal)
Winfield Scott Hancock (Seal)
John Hancock (Seal)
Baldwin R. Hancock (Seal)
Elmora McClain (Seal)
Dennie McClain (Seal)
Lida Ode (Seal)
Walter Ode (Seal)
Mabel Busey (Seal)
Clifton Busey (Seal)

DOCUMENTARY 20 CENTS DOCUMENTARY 5 CENTS

STATE OF MISSOURI, } ss
COUNTY OF Platte }

Before me, the undersigned authority, on this day personally appeared Alma Hancock, widow; Winfield Scott Hancock, single; Elmora McClain and Dennie McClain, her husband; Lida Ode and Walter Ode, her husband; to me known to be the person s described in, and who executed the foregoing instrument, and acknowledged that they executed the same as their free act and deed.

In testimony whereof, I have hereunto ... hand and ... 10th ...

STATE OF MISSOURI, } ss
COUNTY OF Platte }

Before me, the undersigned authority, on this day personally appeared Mabel Busey and Clifton Busey, her husband; John Hancock, to me known to be the person s described in, and who executed the foregoing instrument, and acknowledged that they executed the same as their free act and deed.

... hereunto ...

It took the signatures of ten persons having an interest in the property to validate this grant of right of way

for instance, this includes opening all fences and installing appropriate gates for the crews to use, cutting down trees and pulling the stumps, grading creek and road banks, and digging pits on each side of hard surfaced roads for the purpose of driving pipes under the roads.

The cable reels are delivered at their designated locations. The rooter plow makes its run. The cable-laying plow lays the cable in the slot. Splicing pits are dug, and the cable is spliced and tested and made ready for service. And the clean-up crew sees that the right of way is left in good workmanlike condition.

Following the construction, the Right-of-Way Man is confronted with one more task. A settlement for crop or other damages resulting from the construction work must be made with each owner or tenant. The damages which may arise from the construction cannot be anticipated, so they must be adjusted after the line is constructed. On many jobs, the line is actually in service before the damage claims are settled.

When a new line is to be built, the right of way must be acquired before any construction activities can begin. Actually, the entire project hinges on the results of the Right-of-Way Man in his negotiations with the property owners. Rights for every property must be secured. There can be no missing links in the chain. For if the Right-of-Way Man fails to secure the right of way on one property, this makes it necessary to reroute the line to avoid the property.

Such a change in the route may well result in a substantial change in line on several adjoining properties. Some of the properties on which options have already been taken may be missed entirely. In such cases, the Right-of-Way Man must reach the owners involved, to arrange for the new location. As well as causing the Right-of-Way Man considerable additional work, a change in the line causes the engineers no end of trouble re-surveying, changing station numbers, and changing the over-all length of the line, which in turn involves the loading layout and repeater locations. Indeed, the failure of the Right-of-Way Man to secure rights on a single property could be serious.

Additional Duties

THE RIGHT-OF-WAY MAN is not infallible. There are at times instances where he is not successful and the importance of the project is such that the company is forced to resort to eminent-domain proceedings. But in the past dozen years it has been necessary to acquire rights through such proceedings in only fifty instances. This is but a tiny percentage of the thousands of properties involved.

In addition to securing rights of way for new lines, the Right-of-Way Man does a great deal of other work in connection with the maintenance of existing lines. Replacement work must be done periodically, and frequently new poles or guys are added to strengthen the lines. The cutting of dangerous and interfering trees must be attended to from time to time. This maintenance work almost always requires additional rights, which the Right-of-Way Man must secure. There is also the matter of purchasing building sites for the construction of repeater stations and micro-wave radio relay stations. And the settlement of claims against the company and of claims of the company against others is included in his duties.

While the Right-of-Way Man encounters a variety of difficulties, there are compensating elements. Fortunately, most of the people of our country are fine, progressive, and public spirited citizens. In most cases, the owner does not wish to stand in the way of progress, and it is his genuine desire to coöperate, rather than the payment he receives for the right of way, that prompts him to grant the company a right of way across his property. Of course, there are bound to be a few exceptions; but a great majority of property owners are extremely interested in the tremendous development in the field of communications today. Many of them feel that in granting the company a right of way across their land, they are making an individual contribution toward the communication system of the nation.

The Kind of Job It Is

RIGHT-OF-WAY WORK is a highly specialized job, and certain fundamental qualifications are required.

First of all, a Right-of-Way Man should have more than average "P.Q.," * which is a measure of what a person does about things and people. It is a yardstick of the traits required to get along with people. Really, his "P.Q." is more important than his "I.Q."

He must be somewhat of a vaga-

* I.E., "Personality Quotient."

bond, since a great amount of travel is involved in the work. A Right-of-Way Man drives his car from 25,000 to 30,000 miles in a normal year.

He should be quite willing to live a good part of the time in hotels and eat restaurant food—not to mention an occasional lunch of cheese and crackers plus a bottle of pop, which is a popular country grocery store lunch.

The ability to plow a straight furrow, milk a cow, husk a shock of corn, or cut up a cord of wood at times makes a very favorable impression on a farmer.

Each job is in many respects like each individual: no two are quite alike. Many are rush jobs. The physical nature of the land varies on nearly every job. On one job, a great deal of woodland is involved, on another there are rugged mountains to cross. Some lines pass almost entirely through wide open spaces; others, through numerous villages and towns along the route. Some areas are composed of large tracts; others, of very small properties.

All these conditions have some effect in the securing of rights of way. For this reason, no two jobs of comparable length are completed in the same amount of time. The time required to secure the rights of way on a new line is quite unpredictable. Increasing the number of Right-of-Way Men on a job does not necessarily result in the job's being completed in a shorter time. Certain situations arise on every job which take time to iron out, and there are no short-cuts.

In spite of the complications involved in securing rights of way, many jobs—not only the rights of way but the engineering and construction as well—are completed in fast time. By way of illustration:

A few years ago a new line was to be constructed between two key cities over a distance of approximately eighty miles. This was a *super rush* job; so much so, in fact, that the right of way was scheduled to be optioned and paid off in *six weeks*. This was a rather large order, but it was accomplished in six weeks from the day the first option was taken. The construction forces began work on part of the line in less than four weeks after the optioning was begun. The Plant Department was able to proceed with its construction on the entire line in six weeks to the day!

In addition to optioning the eighty miles, twenty miles of the original route had to be re-routed after it had been optioned. This required the optioning of an additional twenty miles on the re-route, or a total of 100 miles optioned in the six-week period. Six Right-of-Way Men did this job, including the purchase of five repeater stations sites.

Never a Dull Moment

CONTACTS with property owners along the route of a line are not without their interesting incidents.

Some time ago a construction gang of a dozen men was digging holes for the construction of a pole line, which ran diagonally across a twenty-acre field adjoining some farm buildings. The farmer and his wife had already granted the right of way, of course; but the farmer believed for some reason that he should have been paid a larger sum, and he decided not to permit the line to be constructed across his farm until he received ad-

Since most Long Lines cables run cross-country, much of the Right-of-Way Man's time and effort are spent in rural areas—as in the instance pictured here

ditional compensation. So he ordered the men out of his field. The foreman immediately got in touch with the Right-of-Way Man, who tried to reason with the owner. As a last resort, the Right-of-Way Man told the crew that it could go ahead with the work.

The farmer then went to his barn and turned out into the field a vicious bull. In less time that it takes to tell, all the men were out of the field and some had put two or three fences between them and the bull, which was pawing up the earth and bellowing. The Right-of-Way Man again attempted to reason with the farmer, and also exhibited to him the right-of-way grant that he and his wife had previously executed. To this the farmer's response was, "Why don't you show that paper to the bull?"

An example of how important it is for the Right-of-Way Man to familiarize himself fully with the properties under negotiation was the acquisition of right of way from a very obdurate property owner in the South.

When the Right-of-Way Man called regarding the right of way, the owner virtually turned his back and walked away and would not discuss the matter at all. From the records it was learned that the tract in question was bounded on one side by the run of Goose Creek. It was observed from certain indications on the ground, confirmed by local inquiry, that the creek had changed its course. As a result, the tract had apparently decreased in size approximately eight acres, which were not in the possession of the true owner, the individual from whom the right of way had to be acquired. Armed with this information, the Right-of-Way Man called on the property owner and immediately asked whether an agreement could be reached regarding the right of way if he were shown

that he was the true owner of eight acres of land which he did not know about. He agreed to the proposition that, if the Right-of-Way Man could prove the point, there would be no further difficulty about the right of way. Accordingly, he was shown that the deeds under which his title was derived had always referred to the run of the creek as the boundary line on that side, and that when the creek had changed its course the old boundary line continued to be the true one.

The owner was delighted to obtain this information and had a survey made, which indicated that actually some fifteen additional acres thus rightfully belonged to him. Needless to say, the right of way was obtained without further difficulty.

ANOTHER TRYING, if rather amusing, incident occurred several years ago during the building of an important re-route.

It was absolutely necessary that the projected line cross the property of an old hermit. He heard that the Right-of-Way Man intended to call on him, and proceeded to hide out every time he appeared. After several attempts, the Right-of-Way Man learned from neighbors that the old hermit was an accomplished violinist, who many years before had won an old-time fiddlers' contest in a nearby city. With this information, the Right-of-Way Man managed to approach the old fellow one morning. The hermit was ready to run, but the Right-of-Way Man quickly told him he merely wanted to hear him play his violin. The hermit melted somewhat and consented to play. Prompted by the Right-of-Way Man's praise, the old fellow proceeded to fiddle for some seven hours. Being unable to approach the business at hand, the Right-of-Way Man finally stopped the old man, announcing that he was so pleased with the performance that he wished to take his picture. The fiddler was delighted to pose for several shots with his violin under his chin. By this time, he had been completely won over, and the grant was secured.

The Right-of-Way Man's report to the office said "Mr. X signed up, but he was damned liberal with my time." This narrative will explain what a Right-of-Way Man means when he reports that he is fiddling around with a property owner.

Dealing with People

ONE OF THE most important aspects of a Right-of-Way Man's job is "Public Relations."

Indeed, a Right-of-Way Man is a public relations man. On his initial contact, his most important responsibility is to establish friendly relations with every individual with whom he deals in his negotiations for rights of way. Unless he succeeds in this, he will be unable to obtain all the rights he needs.

Once friendly relations are established, it is most important that they be preserved, and the Right-of-Way Man exerts himself to the utmost to see that this is done. Yet one act of negligence, a discourtesy to an owner, or lack of reasonable consideration for his property, on the part of any telephone employee, can ruin the friendly relations previously established.

The importance of good public

relations with property owners may be illustrated by the following figures. In 1947, the year in which most of the right-of-way for 1948 construction was purchased, the A. T. & T. Long Lines Department acquired completed rights of way for 1,843 miles of new lines, crossing approximately 5,300 properties, obtained 861 mortgage releases, and purchased 179 repeater station sites. About 1,525 miles of new lines, crossing approximately 4,600 properties, were optioned; 1,027 grants were taken for reroutes and maintenance work and 18 repeater station sites were purchased on existing lines; 2,265 claims for damages, arising from plant construction and maintenance, were settled. These activities entailed negotiations by Right-of-Way Men with some 27,000 individuals. Added to those were many contacts with city councils, boards of county commissioners, zoning boards, and other governmental agencies.

The Operating Companies of the Bell System also are actively engaged in a great expansion program, and their right-of-way problems are much the same. This is particularly true as regards the extension of toll lines, which are constructed almost entirely on private property.

Thus the number of individuals dealt with in the acquisition of rights of way is very large, representing a cross section of our country. Every negotiation or contact creates some impression in the mind of the individual. Whether it is good or bad is up to the representative who makes the contact. The Right-of-Way Men are well aware of this, and endeavor to conduct themselves and their dealings appropriately.

THE ACTIVITIES of the three groups involved in constructing a new line function somewhat as a football team.

The engineers act as the quarterback, selecting the route and laying out the line. This might be considered calling the signals.

The Right-of-Way Men, who open the holes, are the blockers, running the interference, so to speak.

The construction forces are the ball carriers, laying the cable and meeting the service dates. This might be termed making the touchdowns.

Of course the touchdowns win the game, but the blockers do help make it possible to march down the field.

Serving Bell System Companies from Coast to Coast, the Men of Western Electric's Installation Division Form a Mobile Force Which Is Unique in American Industry

Installation by Western Electric Company

Alvin von Auw

BETWEEN THE SUPPLY and the demand, between the high-level production of Western Electric's factories and the need of the Bell System's operating companies for more central-office facilities, stands the Western Electric installer.

Meet the installer.

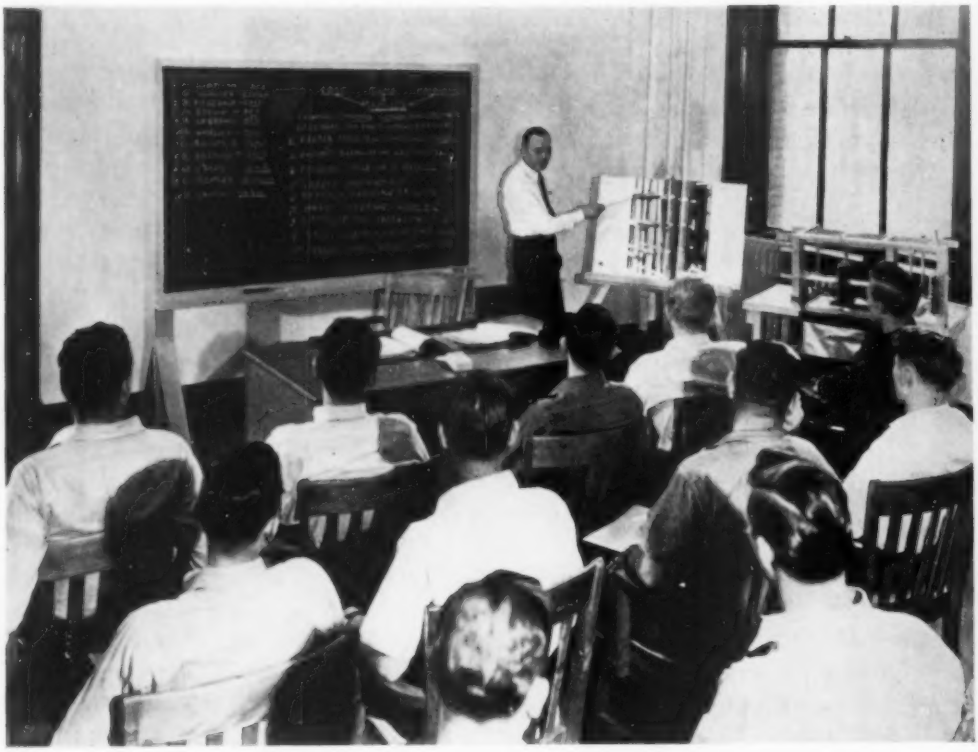
He is a member of a big and versatile branch of the Bell System: Western Electric. It manufactures for the System companies equipment of many kinds, and buys from others what it doesn't make. It keeps quantities of supplies at hand for those companies, through its 28 distributing houses from coast to coast. It installs the central-office equipment it makes, through which one telephone may be connected with any other telephone almost anywhere.

This last is what the installer does, of course. He is a member of Western Electric's Installation Division.

For more than three years now, the installer has occupied a decidedly important spot in the Bell System scheme of things. For it is his job to make ready for service the intricate central-office equipment so vital to the System's program of expansion.

Western Electric's Installation Division is a force unique in American industry. It is a mobile force, and a competent one. It has to be. Western's army of installers must be deployed in widely scattered locations, some jobs calling for man power running into the hundreds, some for as few as two or three men. For every type of manual, carrier, and dial equipment Western Electric makes, the installation army must provide a matching skill. And it does.

The Bell System maintains in this country a force equivalent in size and skill to whatever routine or emergency tasks its public responsibilities may require of it. The Installation



Central-office installers don't come ready made; their job takes training. In the face of an unprecedented increase in its installation force, Western Electric turned to classroom instruction to supplement on-the-job training

Division is a part of that force: one whose skill and experience in central-office installation operations may be applied at whatever points the needs of the telephone system demand.

THE INSTALLATION DIVISION is an organization in which youth and experience have joined forces to face the heaviest construction program in Bell System history. Long-service installers have shared their knowledge with the thousands of young men who, since the war, have joined the ranks of Installation. Today the average installer is 25½ years of age. Chances are he's a veteran, for about 67 percent of the Division's present force saw service in World War II. To the life many installers lead, the word "routine" scarcely applies. They're on the move, seeing new places, new faces, and developing—if, indeed, they do not already possess it—the self-reliance that comes from meeting and overcoming a diversity of challenges, on and off the job.

The post-war years have been the most active in all of Installation's history. On V-J Day there were less than 5,000 people on the Division's rolls; today there are some 22,000. And the measure of the increase is the measure of the job Installation has been called upon to perform.

Under the sharp eye of an experienced instructor, a student installer practices the connecting and soldering operation as one step in the far-reaching training program

In the campaign to reduce the telephone companies' "held orders" for service, the installers are shock troops. During these strenuous post-war years, the installer has kept pace with the rising tide of production in Western Electric's factories; he has pared installation intervals in order to provide more central-office facilities for a telephone-hungry America. For, month after month following the end of the war, as more and more Americans applied for telephone service, the number of orders for service unfilled because of lack of central office facilities mounted—despite Installation's progressively higher levels of activity.

In the long run this sustained effort paid off. By mid-summer of last year came the turning point: the curve of orders held for lack of central-office facilities turned downward from a peak of 1,634,117 in June 1947. At this writing, such orders stand at something less than two-thirds of that. There's still a big job ahead, but installers may well take pride in what has been done to date.

Post-war Training

THE MAN-POWER to meet post-war installation demands did not come ready-made. It took training. And the training took planning.

Normally, "rookie" installers are

trained on the job through experience, in close association with experienced long-service installers. But when, during the latter days of the war, the Installation Division began to take the measure of the peace-time job ahead, it was immediately apparent that on-the-job training of the thousands of new men required would be impractical, and would dilute the experience level of the force to a dangerous low. Against the day of victory, then, the Division planned an extensive program of classroom training to supplement job training. Courses were outlined in detail: some to run for as long as 36 days, some for as little as one. Textbooks were prepared and training aids built.

At its peak, Installation's nationwide "vocational school" was comprised of some 100 branches in 80 cities and towns. During 1946 the average working day found 10 percent of the field force in the classroom; in 1947, six percent. Training in 1947 accounted for approximately 381,000 man-days.

Training courses are divided into three levels: "basic," "technical extension," and "supervisory." The latter is especially important in an organization with a supervisory force which today numbers approximately 75 percent of the total force which existed on V-J Day. Today the training program in Installation has passed its peak. The force is stabilizing and for the most part—thanks to the intensive instructional effort of the first two post-war years—already possesses the skills required of it.

Basic training continues for replacement personnel, and supervisory training will go forward as well. But the need for organized class-room training in advanced installation techniques has largely passed, since "graduates" of the training program have demonstrated in sufficient numbers that their instruction has given them the fundamental know-how which will enable them to develop advanced skills on the job.

Behind a manual switchboard: adding new central-office facilities without interrupting service over existing lines

GETTING the right man to the right place at the right time is no mean feat even in normal times for an organization with the number and variety of tasks Installation faces. It is a

problem enormously increased and made more complex by the heightened tempo of post-war activity and the seven-fold increase in the force.

Training and placement of a vastly expanded force, however, are but two of the problems Installation is meeting and overcoming to reach its unprecedented post-war goals. Some of the difficult conditions with which the installer has coped include material shortages, building construction delays, transportation difficulties, trucking and other strikes, and the serious housing shortage which has hampered assignment of personnel. While the housing shortage cannot be said to have been solved, installers have found the necessary accommodations, thanks to advance surveys by supervisors, the ingenuity of installers themselves—some own trailers—and the help and hospitality of telephone company people. And whatever the problems, installers have faced them with the resourcefulness which has evolved in this organization over the years as a result of the widespread nature of its work.

A look at the record will demonstrate how effectively these problems have been—in military parlance—neutralized. A total of 2,052,000 dial lines and 7,471 new and re-used local manual and toll switchboard positions was installed in 1948. These figures are 40 percent and five percent respectively over 1947, the second of three successive years which have seen previous installation records shattered.

Installers are as "deadline-conscious" as newspaper reporters. Of the 33,150 orders started during 1948, 95 percent started on original schedule. Of the 33,507 orders completed in the same period, 91 percent were completed on original schedule.

Nation-wide, Unified, Flexible

THE GEOGRAPHY of the Installation Division is nation-wide. Right now, installers are working in approximately 1,700 buildings in about 1,500 different cities and towns from coast to coast. The Division's operating organization is divided into three zones—Eastern, Central and Western. To each zone manager, five area managers report. The 15 areas are further subdivided into districts, headed by superintendents who, in turn, direct the activities of area supervisors stationed in centers of heavy installation activity. Organization on this geographical basis permits effective liaison with Bell telephone company people from the headquarters to the local level.

The *flexibility* feature of a unified nation-wide installation force is an important advantage to the Bell System. It is an asset clearly demonstrated in emergencies. Take the case of the fire in River Grove, Illinois, a suburb of Chicago. In that instance, installers from nearby and from beyond the state's borders were mobilized in less than 24 hours, and proceeded with the hurry-up installation of an entirely new central office, a job which they completed in the record time of 11 days.

As it is in emergencies, so it is with the Installation Division's regular line-of-duty contribution to Bell System service. The Division takes as its province very nearly the entire area of the Bell System. And within that area, wherever the work is, there you will find the installer.

A 57-volume "Handbook"

COÖRDINATING and servicing these far-flung operations is the business of Installation's "general staff," quartered at 30 Church Street, in New York, a stone's throw from Bell System headquarters at 195 Broadway. Uniformity of policies and practices, of installation techniques and standards on a nation-wide basis, are some of the contributions this group makes to the nation-wide telephone service of the Bell System. It is this uniformity, made effective nationally through common management, which permits two installers from widely separated points to be assigned to the same job and go to work at once as a team—and permits a supervisor to get a job rolling promptly and effectively with a crew in which he cannot see a single familiar face.

This uniformity of practice is symbolized by the installer's "handbook"—not one volume but a veritable five-foot shelf of installation knowledge running to 57 volumes. Each job supervisor is equipped with those volumes pertaining to his assignments, and may order additional volumes as the need arises. For each type of equipment the Division installs, this encyclopedic work sets forth the requirements, as established by Bell Telephone Laboratories; the tools, and the methods to be employed.

The "handbook" began, more than 40 years ago, as a pocket-size pamphlet. As central offices grew in size and complexity the "handbook" grew too, keeping pace with the development of the art and substituting uniform practice for the "tricks of the trade" that characterized early installation activity. Today its 57 volumes incorporate the engineering developments and the accumulated experience of installers over a period of decades—experience analyzed, codified, and disseminated through Installation's central staff for the information and action of all installers everywhere.

The handbook is a "how to do it" manual. For the "what," the "where" and the "how much" of each individual job, installers look to the Equipment Engineers for specifications and blueprints. For jobs engineered by Western Electric, these specifications and blueprints—and the blueprints may run into the thousands for each of the larger projects—are supplied by the Hawthorne or Kearny Works Equipment Engineers. On orders engineered by a telephone company, the specifications and blueprints—both telephone company and Western Electric prints—are supplied by the telephone company's engineers. In either case, Installation's job is based directly upon the requirements of the telephone company and—beyond the telephone company—the needs of the community.

Men, Tools, and Equipment

THE TOOLS IT TAKES to do the job are brought in by the crew, or are provided by the area office from other jobs or from Installation's central stock-keeping organization at the Hawthorne Works in Chicago. Installation is a highly specialized activity, and requires many tools of special design not generally found in other industries. With the growth of radio and allied industries, however, many tools once exclusive with Installation have become standard and readily obtainable from outside

sources. Nonetheless, of the tools the installer uses today—from those in the kit that hangs from his belt to the most elaborate test sets—a large percentage were designed by the personnel of the Division itself, and represent the latest refinements in a process of evolution over more than half a century of installation work.

And with the installation crew come not only the tools required for the job but the furniture and fixtures as well—the desks and files and lockers. For when a job supervisor takes over a new assignment, he moves in and "sets up shop" in every sense of the phrase. On or before "start date," he and an advance guard of installers set up an office and a storeroom and arrange for the receipt of equipment. Then the decks are clear for the material to roll in, and for the men who will transform that material into a fully operative nerve center for speechways.

In case of a 10,000-line crossbar dial exchange of the latest type, the material may weigh in at more than 300 tons. Normal installing interval for such a project is 29 weeks. To make it ready for active duty will require a crew numbering 101 men at the peak and 56 on the average. The man-power required for each succeeding phase of the operation will have been determined by reference to *Manning Requirements,* a manual which details the number of men needed for typical installations.

Three hundred tons of equipment, then, and 101 men. To tell what the latter do to the former involves some sizable statistics. Before the job is done, the crew will have run more than 10,000,000 feet of wire in cable and secured it to racks. They will have soldered more than a million wire ends, each to its proper terminal. And they will have tested and checked the adjustments of some 125,000 items of electromagnetic apparatus.

THE INSTALLER'S is the final responsibility for seeing to it that all the Western Electric products that go into a central office—the coils from Haverhill, the switches from Duluth,

An installer "fanning" switchboard cables at an office link frame

Making ready: Members of Western Electric's Installation Division are installing cable rack and auxiliary framing before erecting frames for a crossbar central-office installation

the cabling from Tonawanda, the dial and manual assemblies from Hawthorne and Kearny, the cords from Point Breeze—that all, including the material furnished by outside suppliers, live up to the Bell System standards when they have been assembled as a working unit. Not till every circuit has been tested and the completed project "verified" in every respect does Installation put the final OK on Western Electric's product.

The roving engineers from the staff of the Installation Division's Engineer of Quality, Wage and Business Practices constantly make quality samplings of jobs in every area from coast to coast. This quality control organization supplies management with a steady flow of information on the quality level being maintained by the field forces, thus insuring that prompt action may be taken whenever necessary to uphold predetermined standards of workmanship. Installation's monthly *Quality Report* sets forth the relative quality standings of all areas. Symbol of top standing is the "orchid" awarded each month with suitable notice in *The Observer*, the Installation Division's employee paper.

Installation's emphasis on quality first, last, and always derives from an ingrained sense of the direct relation between equipment standards and Bell System service standards. There is, of course, strong logic in a relationship between supplier and customer which places responsibility for the quality of equipment upon the manufacturer of that equipment. From

The final stages of installation of a crossbar central office. Compare this orderly mass of intricate equipment with the view on the opposite page

this viewpoint, installation can be considered as an extension of Western Electric's manufacturing process: manufacturing which is completed on the customer's premises. Thus, installation is the last link in the chain of services Western Electric performs in providing central office and PBX equipment to the telephone companies of the Bell System.

Time was when the cutover of a 100,000-line project like that described above was an occasion for celebration and speech-making by dignitaries, both corporate and municipal. Today there just isn't time. Installation assignments come thick and fast these days and every assignment, large or small, comes "Urgent! Rush!" Nowadays, when a job has been certified ready for service, the installer cannot wait for dedication ceremonies. He's off to a new job, perhaps in the same town, perhaps a hundred miles away.

That next job may not be a big city project like the 10,000-liner. This time you're just as likely to find the installer crouched behind the switchboard of a small town, adding facilities to the telephone network—and doing it without interrupting existing service. Or you may find him at work in the desert or on a mountain top, putting in repeater stations on carrier lines or the equipment for a micro-wave radio relay station.

Whatever the job, large or small, today's conditions place a constant demand on the installer's ingenuity and resourcefulness. And he is meeting the demand.

The "Itinerant Installer" of Installation

THAT'S in the tradition of Western Electric installers; a tradition that goes back to the days of the "first installer," Charles Brady, who worked out of the Clinton Street Shop in Chicago in the 1880s.

Installation was a one-man operation in those days, and so was equipment engineering. In one corner of the shop E. G. Hovey wrote switchboard specifications; in another corner Charles Brady built and wired the board to meet those specifications. Then, the shop work completed—history has it—Charles would pack up his gear, set his derby at a rakish angle, and sally forth to the installation on the customer's premises.

So much for history: now a little about the "mythology" of Installation. What Mike Fink is to the riverman and Paul Bunyan is to the woodsman, the Itinerant Installer is to Installation. And there are tales told of the Itinerant Installer that rival those of other heroes of American legend. The chronicler of the deeds of the Itinerant Installer has been silent of late years, and perhaps there are men in the Installation Division now who have never heard of him. Perhaps there are even some who, having heard of him, do not believe. For such sceptics the chronicler had an answer. To old installers he counselled as follows:

"Tell 'em about the super-solderer he was. How he tapped, laid, webbed, clamped and tested a 10,500 multiple through 15 sections in two hours and 17 minutes. Tell 'em how he memorized every blueprint ever sent out by Hawthorne or Kearny. How he used to shoot trouble with his special trouble gun. And never missed. Give 'em the lowdown on how he used to grab two handsful of 20-foot superstructure bars and put up more ironwork in 12 minutes than the shop could ship in two weeks. He could sew cable with his bare feet while he ran it with his hands. . . . He began to live on that day in the dim past when the first solder-slinger wiped the tip of his gas-heated iron with a horny thumb. He lives today and will continue to live as long as Crabtree Corners needs 20 more answering jacks or a more urban center needs another unit of crossbar. He lives in the hearts of installers everywhere. . . . They know not whereof they speak, those who say the Itinerant Installer never lived."

The Things Men Live By

Walter S. Gifford

The following are excerpts from an address by the Chairman of the Board of the A. T. & T. Company at the Charter Night dinner, on November 5, 1948, of the new Pioneer chapter named in his honor.

LOOKING BACK over my years in the business—forty-four and one-half, in fact—I can think of no enterprise I would rather have been in. This is not because I became the top of management, with its responsibilities, but because, as the years went by, while everything wasn't always to my liking, I felt that, fundamentally, management was interested in fair treatment of employees and in seeing that each made the most of his or her abilities and that promotions were made as they were earned.

Telephone Pioneers have not only pioneered in the art of telephony but in equitable treatment of employees. In 1913, thirty-five years ago, for instance, the Bell System pioneered in establishing a benefit plan which provided sickness, accident, and death benefits and pensions without cost to employees. How important that step was is seen by the fact that the pension funds, paid for entirely by the [Bell System] companies, now amount to over $850,000,000.

Today, many unions are seeking such benefits in other industries, and some strikes have been called in trying to get them. We got them thirty-five years ago—not by strikes or threats of strikes but because our management pioneered in labor relations as well as in technical developments—and it wasn't paternalism, which I for one would have resented. In putting the plan into effect, Mr. Vail, who was then president of the American Telephone and Telegraph Company, said, "This is justice, and without justice and sympathetic interest we cannot hope to do a thoroughly good piece of work."

So also have been the many improvements in working conditions over the years. In fact, it is hard to find any business that offers as much—and I think there is no business that offers more—for those who have spent a substantial part of their lives in it or, indeed, for those who are just starting in it . . .

We have all felt, over the years, the inspiration of "the message must get through." Much of the joy of living would be lost if the younger members of our enterprise, who some day will be members of the Telephone Pioneers, fail to recognize the intangible thrill that comes of loyalty, not necessarily to an organization, although that means a great deal to those who feel it, but loyalty to an ideal, to a job well done, and particularly to a job well done that means so much to the welfare and happiness of so many. Those, after all, are the things that men live by; they are the kind of things that make life exciting and worth while. . . .

Our country leads the world today. We in the telephone business will see to it, I am sure, that our telephone service continues to be the best in the world.

Effective Handling of the Sale of Pullman Space Depends On Three Principal Factors: Traffic Volume, People, and Telephone Equipment

Telephone Facilities for Railroad Reservations

Justin E. Hoy

Editor's note: This article is based on information gathered for a talk which the author was invited to present at the 1948 Annual Conference of the Communications Section of the Association of American Railroads, held at Colorado Springs, Colo., September 28–30.

THE USE of telephone service in the handling of space reservations is a subject of importance to both the railroads and the telephone companies.

To the railroads, telephone service is important because it is a vital link in the sale of "space"—"uppers," "lowers," "roomettes," drawing rooms, and other accommodations. Providing the service is a major operation requiring many people and representing a sizable item of expense to the railroads; and it involves a great many contacts with the public and thus affords many opportunities for building good public relations.

The matter is of importance to the telephone companies because for practically every unit of space sold at least one telephone conversation takes place, and frequently more.

For both the railroads and the telephone companies, the problem of handling reservations is of increasing importance because, as time goes on, more and more space is being made available for reservation.

Railroads follow in general one basic plan in handling space reservations at a centralized bureau.

The customer may either go in person to a ticket office to make his reservation or he may call the reservation bureau by telephone. If he goes in person to a ticket office, a ticket seller telephones the bureau to secure the space assignment. In this instance one telephone call takes place.

If, on the other hand, he calls the bureau, he is told that the reservation will be held for him for a stated interval, during which he must go to a

An example of what railroad people mean by "space": an outside-looking-in view of a new type of drawing room, with berths for four and seats for seven, in a post-war stainless steel sleeping car

ticket office to pick up his transportation ticket. When he appears at the ticket office, the ticket seller confirms the space by telephoning the bureau. In this latter instance, two telephone conversations take place.

While it is true that there are some deviations from this basic pattern, by far the majority of space sold follows one of the two methods just described.

Most of the larger railroads have established centralized bureaus to handle reservations, and it will be the purpose of this article to discuss some typical telephone installations, and their operation in the bureaus which control space assignments; the more common problems being encountered; and some of the steps which have been taken to help solve these problems.

It is true, of course, that in many cities the volume of telephone calling about reservations is not enough to warrant centralized reservation bureaus. But to the extent that telephone service *is* used in making reservations, the underlying communication principles are the same. It is also true that in many instances the reservation job is only a part of a larger operation in the centralized bureau, which may also have other functions: the handling of information calls, the operation of message desks where communication to out-of-town points is concentrated. However, this article will stick to that portion of the bureau definitely assigned to the reservation job.

It may be helpful, along about here, to take a look at the types of space available for reservation.

Originally, sleeping accommodations on trains consisted only of the traditional "upper" and "lower." Now these accommodations have been expanded to include sections (a combination of an upper and a lower berth), roomettes (a small room containing one berth and lavatory facilities), bedrooms (larger rooms, usually having two berths), drawing rooms, compartments, and even apartments. In addition to sleeping accommodations, many railroads are expanding the practice of reserving seat space in coaches.

To complicate further the job of the railroad reservation people, Pullman cars themselves differ greatly in make-up. One car may contain ten sections and two drawing rooms. The car next to it may contain eight sections, one drawing room and two compartments.

Again, many trains change in the character of their make-up between point of origin and destination. For example, a train traveling between New York and Chicago may pick up or drop off Pullman cars at stated points along the way. A certain car, which, let us say, is to be dropped off at Cleveland, is therefore suitable for assignment to passengers traveling to certain points between New York and Cleveland, but it would not be suitable for assignment to passengers traveling beyond Cleveland.

All of this means that before the train starts its run, railroad reservation people have had to assign particular space in particular cars to particular ticket holders who wish to travel to a particular city at a particular time of the day.

The statistics in the box may help visualize the size of the problem confronting the railroads in handling such space assignments.

Reservation Bureau Operations

Now let's take a look at the inner workings of a reservation bureau.

Each item of space that is available for assignment is represented by a block on a card 9 inches long and 3½ inches wide, and the type of space, such as lower, roomette, and so on, is designated in the block. Each of these cards is called a diagram, and one is maintained for each car that contains reserved space. Since space is sold in advance, a separate diagram for each date is also necessary. Usually all of the diagrams for one car for, say, 30 consecutive dates are made up in a pack.

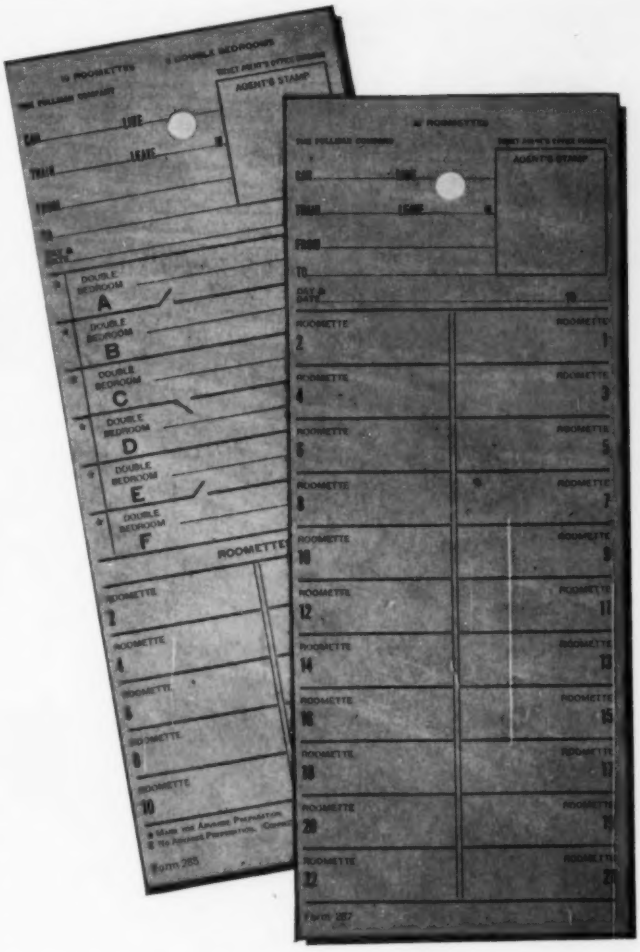
The diagram packs for any one train are usually closely associated in a diagram rack. As reservations are made, suitable notations are entered

APPROXIMATE FIGURES FOR THIRTY-DAY PERIOD AT FOUR TYPICAL RESERVATION BUREAUS

Location of the Reservation Office	*Number of Units of Space Available for Reservation*	*Number of Incoming Telephone Calls*
New York	113,250	234,000
Cleveland	39,000	51,000
Chicago	36,000	51,000
San Francisco	90,000	108,000

in the corresponding blocks by the reservation clerks to indicate that the space has been sold or is being held on reservation. Each day, diagrams for that date are removed from the packs and forwarded to the train and corresponding diagrams representing the 30th day hence are added to the packs.

The volume of calls received at a reservation bureau requires a number of reservation clerks. Since the clerks must have access to the diagrams in order to handle the calls, all of the larger reservation bureaus have to be set up into different units, each unit handling calls for certain trains only. In this way, reservation clerks need access to only a portion of the total number of diagrams in the bureau. Because each clerk in any one unit must have quick access to all of the diagrams in the unit, the physical design of the diagram racks limits the number of people who can answer calls in a single unit to a maximum of about 12.



There is a diagram such as these for every car which has reserved space, for every day it runs

Two types of diagram racks are most commonly used. One consists of a series of open-ended pigeon holes mounted in the center of a long table accessible to clerks sitting on both sides. The rack itself may slide up and down the length of the table so that each pigeon hole is within reach of any clerk.

The other type is circular in design and consists of a rotating drum around which is a circular table. The drum is made up of tiers, so that it can be revolved in sections, and thus every clerk sitting at the table has access to the diagrams mounted in the drum. In addition to the diagrams, the circular drums frequently contain a

series of peg panels, one panel representing each car for which there is a corresponding diagram pack and each peg representing a unit of space. The pegs in the panels permit the reservation clerks to tell at a glance, without referring to the diagram packs, what space is available. As space is sold, the corresponding pegs are removed from the panel.

Telephone Requirements

FROM THAT brief description of the bureau operation, the telephone requirements begin to become apparent.

In the first place, where bureaus are subdivided into units, screening of incoming calls is necessary to determine which unit should get the call. This means that switchboard service is necessary. This, in turn, means that lines from the switchboard to the answering positions manned by reservation clerks are also necessary. Further, since incoming calls are received from ticket sellers as well as from prospective customers, lines from the ticket offices to the reservation bureau are also necessary.

With respect to the answering equipment at the reservation unit, order turret equipment of some sort is indicated. Many installations employ No. 4 order turrets, which are small key boxes in which one incoming line from the switchboard terminates. In addition, there is an overflow line which is common to a number of positions. With this equipment, the reservation clerks who are ready to receive calls are indicated to the P.B.X. operators by means of

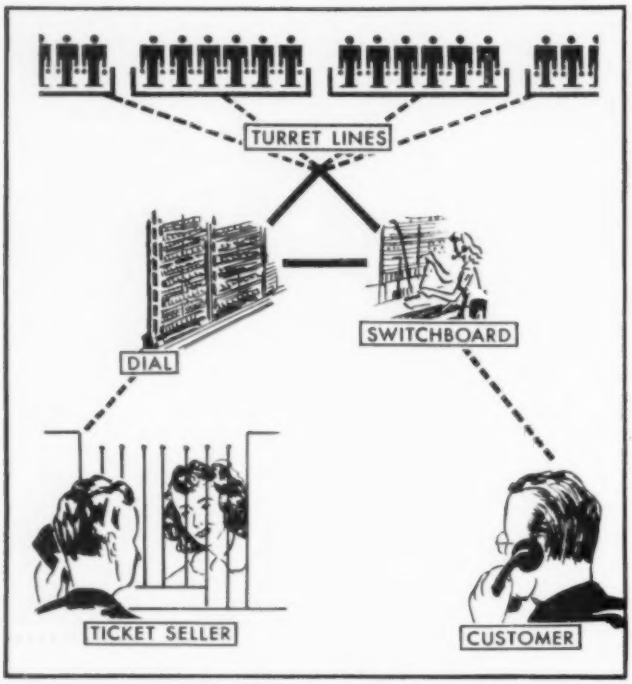
These racks slide along the table, and the diagrams in the pigeon holes are available to clerks on both sides. The flush-type key telephone equipments are No. 4 turrets

The three tiers of this "drum" revolve, the diagrams are between the panels, and each peg represents a unit of space. No. 100 key telephone equipment is at the left of each clerk

lamps at the switchboard and incoming calls are completed only to these positions. The presence of overflow calls is made known to reservation clerks by means of overflow lamps at the key boxes and these calls may be answered by any clerk in the unit—usually the first one to become available.

Other installations employ different types of order turret equipment, such as the No. 2 turret, or 100 or 101 key equipment. These types of equipments permit clerks to answer any of several lines (usually all the lines in the unit) and are necessary in installations where lines from the ticket sellers are separate from the lines used to complete incoming calls from the switchboard.

Regardless of the type of answering equipment employed, one of the primary requirements in the way of telephone equipment in reservation bureaus is the provision of adequate monitoring equipment. This apparatus may be designed to permit supervisors to know which reservation clerks are busy and which are ready to receive calls; to know how many calls are waiting at the P.B.X. and for what units they are waiting; to observe the handling of calls; and to be able to assist reservation clerks in handling certain calls. Proper coverage of answering positions within the bureau as well as effective handling of calls are two essentials to the successful operation of a reservation bureau, and adequate monitoring equip-



One arrangement of telephone equipment gives both customers and ticket sellers access to the reservation clerks over the same turret lines

ment helps bring about these two essentials.

Operational Problems

WHAT ARE some of the problems which sometimes arise in the operation of reservation bureaus?

The most common seem to be these:

Too many calls from the public at certain times for the P.B.X. trunk groups to handle.

Too many calls from ticket sellers and the public for the lines extending between the switchboard and the bureau to handle.

Too few positions at each reservation unit to handle the calls directed to it.

Too few people within the bureau to handle calls even were the telephone facilities increased.

Enough people within the bureau but not enough people at certain units to handle the traffic.

Too many inexperienced people in the bureau.

Is the answer to these situations more telephone equipment?

Many railroad men say, "No. We haven't the people to answer the lines we have now, so why put in more?"

Is the answer more people?

Many railroad men say, "Yes, of course. But there we're on the horns of a dilemma. On the one hand, we're selling all the space we have now and more employees would only increase our operating costs; they couldn't possible increase our operating revenues. Yet, on the other hand, we agree that poor service to the customer is poor business for the railroad."

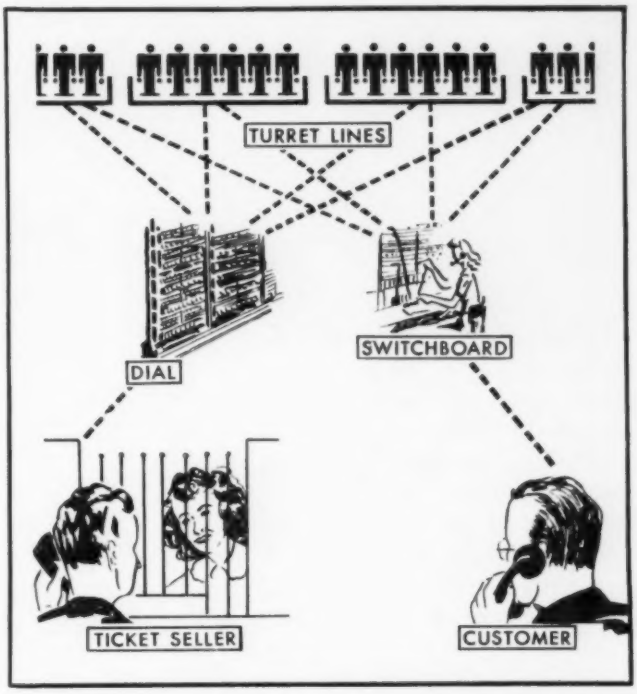
To arrive at a workable answer to these problems, it has been necessary for telephone people and railroad people to join in exhaustive studies, to determine the factors which give rise to the problems and what might be done to remedy the situation.

They have arrived at some answers.

Briefly, the situation boils down to a consideration of three main topics:

Traffic. People. Telephone Equipment.

With respect to the traffic, it has been determined that the railroads themselves can do many things to reduce the loads handled by reservation bureaus. For example, some roads follow a plan which makes it unnecessary for ticket sellers to call the bureau to confirm space assignments when customers pick up tickets after having made a reservation by telephone. This plan naturally reduces the number of calls directed to the bureau. Other railroads have been redesigning diagram racks, and by shifting the diagrams held in certain units have decreased the answering time and the holding time on calls to the bureau.



A different arrangement provides separate turret lines for customers and ticket sellers to reach the reservation clerks

With respect to people, the burden of improvement to be made is again on the railroad. Just as it takes coal to fire a steam engine, fuel oil to run a diesel, it takes adequate personnel to run a reservation bureau. An adequate number of people must be provided to insure good service. However, much can be done to improve the effectiveness of the people on the job through proper training programs. In addition, effective force programming—i.e., having the right number of positions occupied at the right time—will result in better service without necessarily involving force increases. Another important item with respect to people concerns supervision. It is generally agreed that supervision should be adequate to render assistance where needed and direct the assignment of clerks to specific positions.

The task of determining what telephone equipment and how much of it is required to handle the traffic is one which the telephone companies have long been willing to assume. With the assistance of Traffic Department people, Bell System sales and servicing representatives have for years been designing "tailor-made" telephone systems to handle individual reservations jobs most effectively.

While it is fundamentally the railroads' responsibility to determine what they want communications service to do for them, nevertheless, telephone company representatives fre-

quently are able to assist in working out operations and routines which result in better service to the prospective traveler when he calls the reservation bureau. Traffic Department people have done much in working out force requirements with the railroads, and much has been done to develop improved training methods and procedures. Complete surveys and studies of particular telephone requirements are made from time to time for the railroads operating reservation bureaus in practically all of of the larger cities throughout the System.

Constructive Efforts

RESPONSE to the activities of telephone company people on the part of the railroads has been, in many cases, highly appreciative.

Two examples may be cited here:

In Cleveland, the performance at a particular reservation bureau was not satisfactory. Reservation clerks were slow in answering incoming calls, and, when calls were answered, long delays were encountered in completing transactions. In technical terms this bureau was suffering from "slow answers" and long "holding time." A survey pointed out the need for (1) a revised system of filing diagrams, (2) redesign of diagram racks and seating arrangements, (3) a telephone system which would direct individual calls to available clerks, and (4) a training program for reservation clerks. All of the recommended changes were made, and as a result answering time dropped from an average of 42 seconds to 4 seconds and the holding time from 280 seconds to 120 seconds.

In Los Angeles, where another bureau was rendering an unsatisfactory grade of service, a survey revealed among many things that (1) the number of reservation clerks on duty was too low, and as a consequence unanswered calls were backing up at the switchboard, (2) supervision was inadequate, (3) routines for handling waiting lists and reservations on popular trains were causing serious bottlenecks, (4) the high inexperience factor among reservation clerks called for more extensive training, and (5) a number of improvements could be made in office layout and practices.

Corrective steps included the following: (1) the number of employees in the bureau was increased to provide full coverage of all positions between 8:30 A.M. and 5:30 P.M., (2) the number of supervisors was doubled, (3) a complete training course was prepared and given to all employees, (4) monitoring equipment was installed and hourly schedules of observation were established, and (5) special diagram racks were constructed and the telephone equipment was changed to meet the new operating requirements.

One result of these steps was a reduction in answering time on incoming calls from an average of 45 seconds to 18 seconds. In a letter to the telephone company, the general passenger agent of the railroad stated: "This tremendous improvement has only been accomplished through the valuable assistance rendered by professional advice received through the presence of your representatives who have been so generous with their time and effort."

This job of studying telephone requirements and designing telephone facilities is not completed. Perhaps

it never will be. On all sides is evidence of change. The railroads are streamlining; service to the passenger is the key-note. Practices and railroad equipment which were good yesterday are not satisfactory today. In like manner, telephone equipment arrangements which were good yesterday may not suffice today. It is a distinct challenge to Bell System people to keep abreast of these changing requirements, and to make telephone service for handling the reservations job most effective and most pleasing.

DESPITE popular interest in the failure of the polls to predict the election, our interviewers report that public reaction to our questionnaire seems to be as coöperative and friendly as ever. Apparently our customers do not bracket the election polls and telephone company surveys together. Neither do we.

Our surveys do not attempt to forecast future action as did the election polls. Ours are designed to give us more accurate knowledge of what people are currently thinking about telephone matters. This knowledge makes for sounder business judgment in cases where there is uncertainty or difference of opinion about the attitude or the wishes of the telephone users as to a specific policy, practice, or service.

One of the errors of the election polls seems to have been that their measurement stopped too soon and failed to note a changing trend. Telephone surveys are useful in establishing continuing trends by which we may see whether the opinion of the public is changing for better or for worse on the broad issues that affect our public relations.

From a letter transmitting results of a recent survey on "Trends of Customer Opinion" to the Associated Companies of the Bell System.

Twenty-five Years Ago in the BELL TELEPHONE QUARTERLY

Items from Volume III, Number 1, January 1924

Bell System Ideals Are High

CERTAINLY the Bell System is big; but mere bigness is not necessarily great or wholesome; and neither is it, as some people seem to imagine, necessarily baneful or menacing. Everything depends on its nature, its ideals and purposes, in short, on its spiritual quality. How does the Bell System stand spiritually? Does it meet the tests?

Men whom I greatly respect, outsiders who have no reason to be biased and of whose competence and independence I have knowledge, have written to me and said to me that the Bell System in their judgment is the cleanest and best managed big business in the world. I have had some opportunity to form a judgment in the matter. And I am prepared to say that I know of no other which can be rated above it. I know of no other enterprise, private or public, which has higher purposes or sounder ideals of service. The Bell System has seemed to me to be honest in its purposes and endeavors and clean in its practices. It is aboveboard and frank. It puts its cards on the table. It welcomes government regulation and coöperates cordially with government agencies. It believes in the integrity of American institutions and in the honesty of purpose of American official servants. It coöperates with them to serve the public.

It seeks to be fair to its owners, its employees, and its consumers. It has as its primary or guiding principles to keep its business on a sound and conservative basis, to give to its owners a fair return on their investment, to render to its consumers the best possible service at the lowest cost; and it succeeds in giving them a service which is worth to them very much more than it costs them.

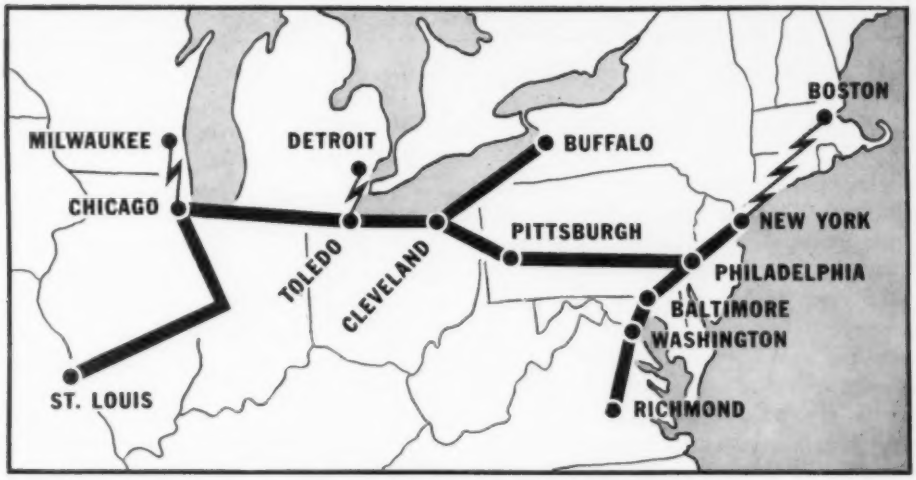
The Bell service is public minded. It is democratic in its responsiveness to public sentiment and needs. It evidences in as high degree as any other agency I have known a concern for the public welfare. Its personnel is animated by a spirit of service.

From "The Achievement of Telephone Pioneers" by former Vice President David F. Houston.

The American Telephone Historical Collection

THE American Telephone and Telegraph Company has started at its headquarters building, 195 Broadway, New York, an historical collection of pictures and papers of all kinds, letters, note-books, documents, to perpetuate the personalities and the records of the men who have done vital work in the development of the Telephone. It has officially been given the name of the American Telephone Historical Collection. It is as the other half of the Bell System Museum of instruments and apparatus at the Western Electric building. The two are intended to supplement each other, the Museum emphasizing the technical side, the consecutive development of the telephone equipment; and this new Collection emphasizing the human side, the collaborating sequence of men in the telephone organization.

From an article by the late William Chauncy Langdon, the first curator.



Bell System Coaxial and Radio Relay Networks Which Carry Television Programs

Bell System's Television Networks Connected

THE BELL SYSTEM'S east coast and midwestern inter-city networks for television transmission were linked on January 11, bringing network television to the greatest potential audience in television history:—a fourth of the nation's population, living in and about 14 major American cities.

The link connecting the Eastern and Midwestern networks is the new Philadelphia-Pittsburgh-Cleveland coaxial cable, which was placed in operation last fall for long distance telephone service. The combined network includes television stations in Boston, New York, Philadelphia, Baltimore, Washington, Richmond, Pittsburgh, Buffalo, Cleveland, Detroit, Toledo, Chicago, Milwaukee, and St. Louis.

The Bell System's combined television network extends over 1,740 route miles of coaxial cable and 370 route miles of radio relay, and provides about 5,000 miles of television channels. The network grew from a 95-mile coaxial cable installed in 1936 between New York and Philadelphia. After the war, which interrupted television development, regular network television transmission between Washington and New York was inaugurated on February 12, 1946, over Bell System facilities for use by broadcasters without charge. Baltimore was added to this network in October 1946.

Using radio relay, Bell System engineers extended the New York-Washington network northward to Boston in November 1947. Richmond was connected to the network by a coaxial cable channel from Washington a few months later. On May 1, 1948, free experimental service was discontinued and the Bell System television network service was placed on a commercial basis. On September 20 last year, the Bell System brought inter-city television service to a new region when it interconnected seven major Midwestern cities.

The present combined network requires large amounts of complex equipment. Along the routes, for example, are 540 amplifiers, which maintain the energy of the television signal as it travels from city to city. Some 250 additional amplifying devices in the television terminals in telephone buildings in each city on the network are used to put the broadcasters' programs on the channels.

Who's Who & What's What

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good idea of what it's all about. He qualifies as expert, as a matter of fact, in such abstruse matters as dial switching systems, and for the last decade and more he has directed most of his efforts toward traffic requirements for toll crossbar and toll step-by-step switching systems and the development of toll dialing methods. Starting with the Missouri-Kansas Telephone Company as a student in 1912, he was a toll traffic supervisor with the Southwestern Bell Telephone Company at St. Louis when, in 1927, he transferred to the Traffic division of the A. T. and T. Company's Department of Operation and Engineering, working on toll results. Two years later he joined the group concerned with peg counts and coefficients, and since 1938 he has been with the traffic operating arrangements group.

WHEN THIS MAGAZINE wanted an authentic description of the job of the Right-of-Way Man, it turned to a member of the Long Lines Department whose nearly 23 years of right-of-way experience include assignments in Pennsylvania, the middle West, the Rocky Mountain states, and New Brunswick and Nova Scotia. After experience with the Bell Telephone Company of Pennsylvania and the Southern Bell Telephone and Telegraph Company, HARRY H. HOOPES joined the Long Lines organization in 1926, and was made a rights-of-way supervisor in 1929. His base is the division headquarters in Philadelphia, but proofs of his article were mailed to him at Uniontown, Pa., and were returned from Carlisle.

A MEMBER of the Public Relations Division of the Western Electric Company since 1939, ALVIN VON AUW took time out to serve as Air Combat Intelligence officer on active duty in the Pacific Theater in World War II, from which he was released as Lieutenant, USNR. He resumed his former post as information supervisor, and has only recently been appointed editor of "WE," a new quarterly magazine for all W. E. employees. He has contributed several articles to this MAGAZINE on various company operations, the most recent of which was "Distribution by Western Electric," in the issue for Autumn 1947.

FROM 1929, when JUSTIN E. HOY joined the Southwestern Bell Telephone Company, to 1946, when he became a member of the A. T. and T. Company's O. & E. Department, he had been successively a salesman of directory advertising; a salesman of exchange, toll, and PBX services; and sales supervisor and sales training supervisor. At the time he left Kansas City for New York, he was supervising the Southwestern company's servicing work with large business firms in the K. C. division; and he has since been occupied in the sales and servicing section of the Commercial division of A. T. & T. He contributed "Helping Customers Improve Telephone Usage Habits" to the issue of this MAGAZINE for Summer 1947.

AMERICAN TELEPHONE & TELEGRAPH CO.
AND ASSOCIATED COMPANIES